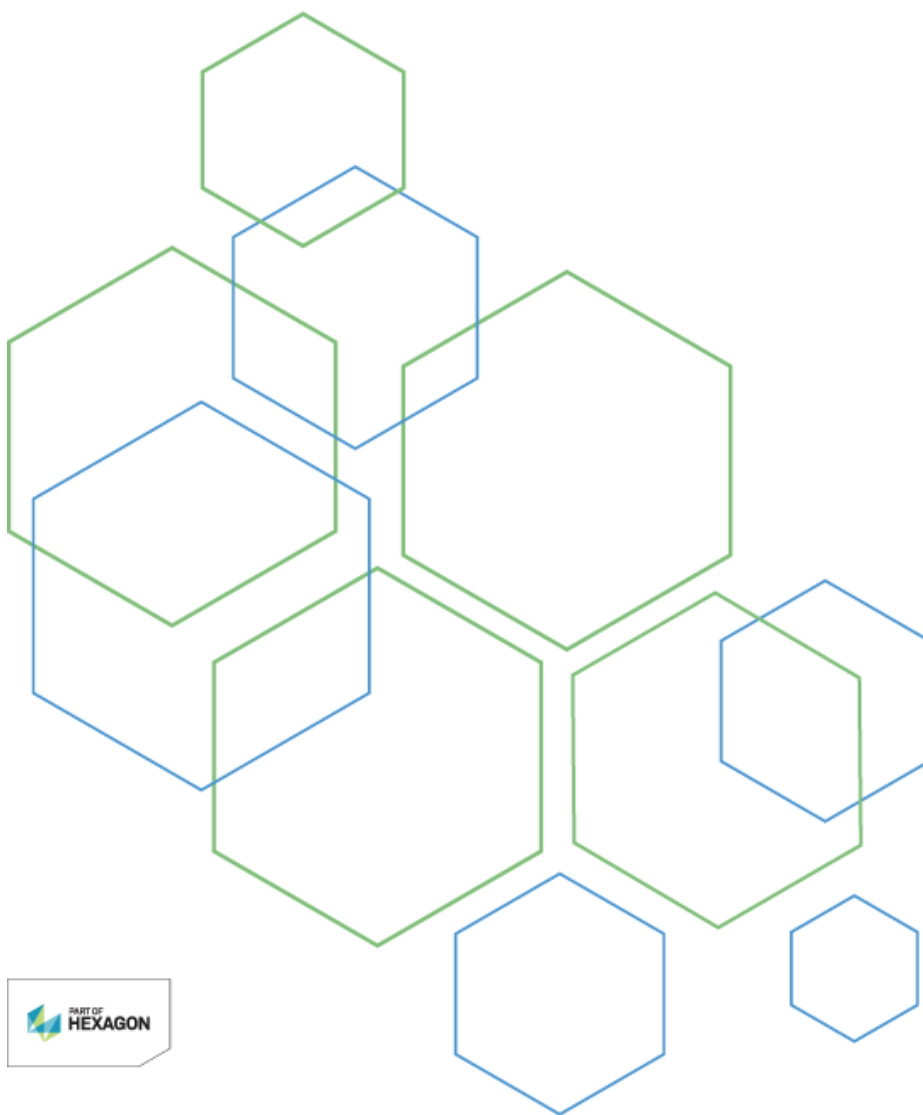


INTERGRAPH®
Smart ➔ **3D**
Interference Checking
User's Guide



Version 2016 (11.0)
November 2016

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Intergraph Corporation
305 Intergraph Way
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Preface

This document describes how to install, configure, and use the Intergraph Smart™ 3D Interference Detection Service. This document pulls together information from several other Smart 3D administrative and user documentation guides. The content includes a list of new features, definitions of terminology, administrative tasks such as installation and configuration, and user tasks such as approving interferences.

Documentation Comments

For the latest support information for this product, comments or suggestions about this documentation, and documentation updates for supported software versions, please visit *Intergraph Smart Support* (<https://smartsupport.intergraph.com>).

What's New in Interference Checking

The following changes have been made to the *Interference Checking User's Guide*.

Version 2016 (11.0)

- Information related to PDS Model Reference has been removed. (P2 CP:276780)
- Added information on the **S3DFoulCheckCmds.CForceLocalIFCCommand** custom command. For more information, see *Interactive Interference Checking (Local Detect)* (on page 25). (P2 CP:265572)
- Added the **Copy** option to the **Interference List** dialog box. For more information, see *Interference List Dialog Box* (on page 35). (P2 CP:265572)
- Added information about the codeless interference checking rules that are now available in Smart 3D. Previously, this functionality was provided by Intergraph Services. For more information, see *Codeless IFC Rules* (on page 49). (P2 CP:251947)
- The interference checking process now automatically recovers if it detects a network connection failure, database connection failure, or the interference checking process runs out of memory. Before this release, you had to manually restart interference checking. (P2 CP:233024)
- **Smart 3D - External Data** and **Smart 3D - Point Cloud** replaces **SP3D - Foreign Interferences** and **SP3D - PointCloud** in the **Compare** section of the **Interference Server Settings** dialog box. For more information, see *Database Detect Tab (Interference Server Settings Dialog Box)* (on page 20). (P2 CP:290356)
- Added the process to update the ProgID of the **Post Processor** rule. For more information, see *Update the ProgID of the Post Processor Rule* (on page 19). (P4 CP:270686)
- Removed the topic *Use IFC Rules to Assign Permission Groups* because it is obsolete.

SECTION 1


Checking Interferences

Interference checking (IFC) ensures that parts do not occupy the same volumetric space and that each part meets the design criteria for clearance. A successful interference check ensures that there is sufficient space around the parts so that they can operate properly, be serviced properly, and be easily installed or removed when necessary. The IFC process can look at all model data, including data from a referenced 3D model, referenced MicroStation and 3D AutoCAD files, and Point Clouds from third-party software with valid connections.

There are two methods for interference checking:

- Server-based interference checking called Database Detect. For more information, see *Server-Based Interference Checking (Database Detect)* (on page 12).
- Interactive interference checking called Local Detect. For more information, see *Interactive Interference Checking (Local Detect)* (on page 25). *Interactive Interference Checking (Local Detect)* in the *Interference Checking Guide*, available from the **Help > Printable Guides** command in the software.

The major differences between the two methods are:

Database Detect	Local Detect
Runs continuously (System Administrator choice)	Works only within the current session
A dedicated server takes care of the IFC process, minimizing impact on users and improving performance	Provides immediate graphical feedback (works immediately after commit.)
Creates persistent interferences that are stored in the Model database	Creates temporary interference markers in a user session, which are not stored in the Model database. After you refresh the workspace, the temporary markers are removed
Based on administrator settings (controlled by permission groups)	Based on individual user settings
Provides feedback on how much has been checked in the entire model	Checks only created and modified objects in a session
Interference markers associate and come into the workspace along with the object participating in the interference	Clears dynamic interferences after refreshing workspace
 NOTE The Smart 3D - External Data option only checks Smart 3D objects against external objects.	Finds interferences involving attached Reference 3D models (with option Interference Detection set to Participate) and

<p>Smart 3D - External Data only checks for interference between two R3D external objects.</p> <p>IFC finds interference between R3D and R3D objects that belong to different R3D projects that participates in IFC.</p> <p>Smart 3D - Point Cloud option only checks objects against point clouds and Smart 3D.</p>	<p>objects in inserted 3D files (MicroStation dgn or AutoCAD dwg) in the workspace without requiring a specific setting.</p>
<p>Includes a referenced point cloud when the Smart 3D Point Cloud Compare option is selected in the Project Management interference checking settings.</p>	<p>Receives the point cloud specification via the File > Define Workspace workflow in Smart 3D when the Smart 3D Point Cloud Compare option is selected.</p>

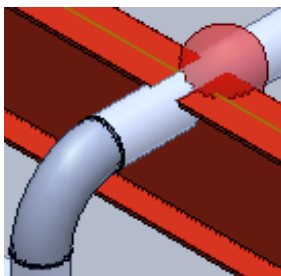
The Database interference checking objects, or markers, appear in the model until other objects are moved so the interferences no longer exist, or the aspects for the interference process are changed. It is not possible to delete an interference object in the same way you can delete other objects in the model. However, you can tailor the display to hide acceptable interferences.

Interference checking can be used with rules in the reference data. The delivered rules include post- processing rules and clearance rules. For more information about the delivered IFC rules, see *Interference Checking Reference Data* (on page 42).

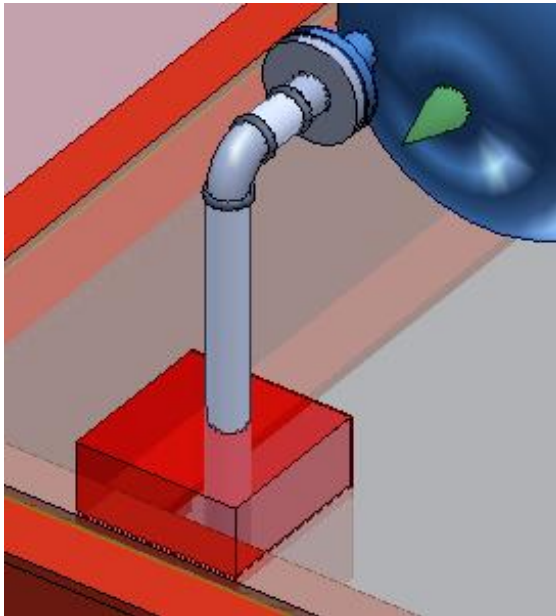
Interference checking can be used with rules in the reference data. The delivered rules include post-processing rules and clearance rules. For more information about the delivered IFC rules, see *Interference Checking Reference Data* in the *Interference Checking Guide* available from the **Help > Printable Guides** command in the software.

How Interference Checking Results Appear

The Database Detect process marks any persistent interference with a spherical interference mark at the location of the interference. For example, the Database Detect service found an interference between this pipe and this beam, so it placed a spherical interference marker at that location.

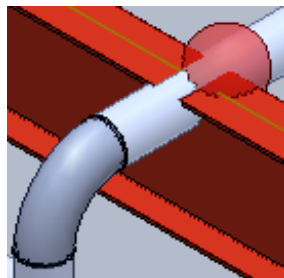


The Local Detect process marks any interference it finds with a cube interference marker. For example, the software finds an interference and places a cube interference marker where there is an interference between a pipe and the floor.

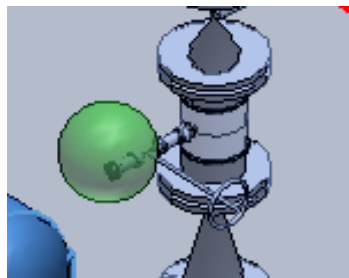


For both processes, the color of the marker indicates the type of the interference: red for severe, green for clearance, and yellow for optional. You can modify the default interference marker colors with the **Format > Surface Style Rules** command. You can change the size of both the Database Detect and Local Detect interference markers using the **Marker size** option on the **Interference Server Setting** dialog box in Project Management task and the **Interference Checking Settings** dialog box in the Common task, respectively.

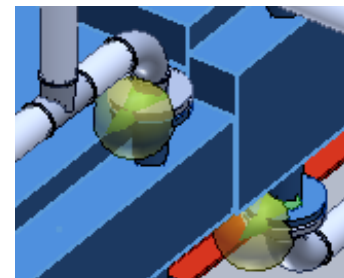
Severe Interference



Clearance Interference




Optional Interference




You can clear the acceptable interferences from your workspace by changing the required action on the *Interference List Dialog Box* (on page 35), and then editing the display properties on the *Interference Checking Settings Dialog Box* (on page 30).

In general, the software checks the parts involved in interfering objects to find and report the interferences. For example, if you have a pipe run that consists of a pipe, an elbow, and a pipe, each intersecting another pipe. The interfering pipe intersects the pipe run at each of the three positions. The software generates three interferences, and then displays them in the **Interference List** dialog box.


If an object has an interference with two other objects, these interferences are listed as two separate interferences in the **Interference List**. You can view all possible associated interferences (selected aspects) of an interference by right-clicking the interference row in the **List** view. This action opens the **Interference Settings** dialog box, and you can then click **Other Aspects** to see a list of all the aspects at the interfering location.

 **NOTE** When an object is brought into the workspace, all of its associated interferences appear, even if they are not part of the filter used to define the workspace.

If an object has a very large range, or if it is located in a dense area of the model, it may take longer to process all of its clash interferences. If the number of parts that the object has to check for clash interferences is greater than 2000, the object is categorized as a delayed part. During the processing phase, these delayed parts are skipped, and then they are reprocessed. If the number of parts that the object has to check for clash interferences is greater than 20,000, the object is categorized as a bad part. The delayed and bad parts are listed in the S3D Error log file.

 **NOTE** An object is also categorized as a bad part if its range or geometry information are unobtainable for the aspects configured for clash detection. The **Properties** dialog box for the clash object describes why the part is bad, and how to resolve any discrepancies. For example, you may have to update the object or process a To Do List item for the object.


The range of values that determine whether or not an object is a delayed part are defined by the **RangeIntersectionObjCountMin** and **RangeIntersectionObjCountMax** registry entries. The registry entries are located in the Intergraph\Applications\Environments\FoulCheck\Settings\Remote folder. You can edit these values to fit your needs. However, editing these values may cause a significant lag in the interference checking process.

 **NOTE** Review the delayed and bad parts for modeling issues and any errors that can result from the displayed object ranges for the aspects selected for interference checking.

Role of the Administrator

An Administrator can limit the access to interference checking to the proper permission groups. An Administrator sets up the options for the background interference checking at the beginning of the project and is the only one permitted to change these options. This capability requires that an Administrator have read access to all objects in the database for the background interference checking to work properly. Users do not need to have access to all objects. For more information, see the *Smart 3D Interference Checking Guide* available from the **Help > Printable Guides** command in the software.

The server-based interference checking process can only be started from a client machine on which both the **Project Management** and the **Database Interference Detection Process** options are installed. The Administrator can run the detection process on more than one model simultaneously on the interference server. When an Administrator starts Database Detect, progress and statistical information is displayed on the **Status** tab of the dialog box.

 **IMPORTANT** Only an Administrator can start the Interference Detection Service (IfcNtSvc) on the system and set up the Interference Detection process (IFCProcess).

Interference Checking License Management

The interference checking process consumes one license to process five models. It releases a license for every five models that stop processing. For example, IFC consumes two licenses to process ten models, one license for processing Model1 through Model5, and then another for

processing Model6 through Model10. Similarly, it releases a license after the sixth model stops processing, and then another after the remaining models stop processing.

★IMPORTANT

- The IFC service does not consume a license when it starts. It consumes a license only while processing the model.
- IFC consumes a license for every five models.
- IFC cannot process a new model if a new license is not available.
- You cannot set a number for processing models in the registry.

See Also

Check Interference Command (on page 26)

Checking Interferences Common Tasks (on page 11)

Display the Interference Status (on page 30)

Set Interference Checking Parameters on a Workstation (on page 27)

Checking Interferences Common Tasks

The following tasks are used frequently when you want to check interferences in your workspace.

Installing and Configuring Database Interference Detection Service

To install and configure the Database Interference Detection Service, follow these procedures in order:

Install Database Interference Detection Service (on page 14)

Configure Interference Service Properties (on page 15)

Start the Database Interference Detection Service (on page 15)

Create IFC Permission Group Folder and Permission Group (on page 17)

Set IFC Permissions (on page 17)

Check Database Interferences (on page 18)

Setting the Local Interference Checking Parameters

You can edit the local interference checking parameters to meet your specific requirements. For more information, see *Set Interference Checking Parameters on a Workstation* (on page 27).

Displaying Interferences

You can control the display of interferences as follows:

- Show all the interferences or only those related to selected objects.
- Hide all the interferences or only those related to selected objects.
- Fit the interferences detected by the software in a view.

For more information, see *Control Interference Display* (on page 28).

List Interferences

You can display the list of detected interferences and edit the objects to correct the problem. For more information, see *List interferences* (on page 29).

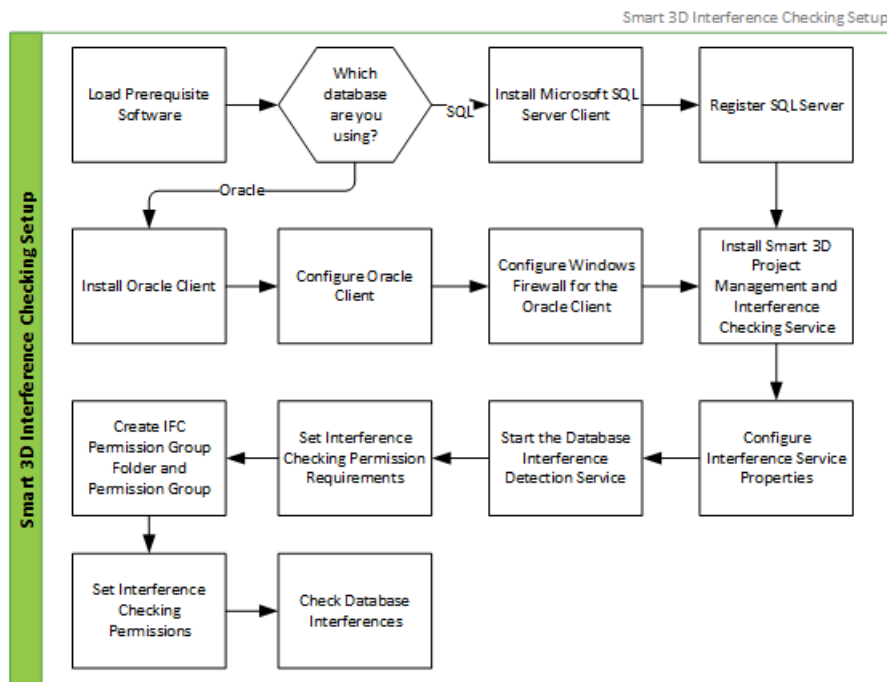
Change Required Action

You can change the required action for the interferences selected in the graphic or list view. For more information, see *Change Required Action* (on page 30).

Server-Based Interference Checking (Database Detect)

Unlike the traditional file-based method of manually defining groups of parts to check against each other, **Check Interference** is a separate software process that runs directly on the Model database. Although the interference detection process can be run on any computer with the **Database Interference Detection Service** installed, due to the intensive nature of the interference check computations, the recommendation is to have a computer dedicated as the interference server.

NOTE In order to monitor interferences, you must install the **Database Interference Detection Service** option on the same computer that the **Project Management** option is installed.



Database detection options are set in the Project Management task. You can also start and stop the interference database detection process in the Project Management task.

Interference detection requires disk space for the file cache that temporarily stores the interference data. Before starting the interference process, the interference server checks to see if enough space exists in the TMP location for the file cache. The server also checks to see if you have the proper permissions to write, read, and delete files in the TMP location. During the process, if the space becomes too low, the software stops IFC, and then displays an error message. These checks primarily apply to the server-based interference process. Although,

they can apply to the local checking process if extremely low or no disk space is available for the temporary folder on the local computer.

★ IMPORTANT Configure automatic disk defragmentation in order to free space for the file cache.

After you start the process, use the **Status** tab on the **Interference Server Settings** dialog box to monitor the start time, progress of the interference checking, time when the last part was modified, and the status of the checking. A box at the top of the dialog box identifies the model that you are checking.

The software automatically checks new or modified objects apart from existing objects. When you create or modify an object, the software checks for interference against all objects in the Model database. The interferences generated by this process are persistent; that is, the interferences are stored in the database like any other objects in the software. You can also modify these objects by changing the properties. Interferences are also assigned to a permission group; thereby the entire process is under the control and restrictions of an administrator.

You can interrupt the automatic interference checking process during a work session without forcing a recheck of all parts in the database when the process is brought back online. When you restart the interference check process, the software begins checking where it left off when the process went offline. However, if you change any of the options on the **Interference Server Settings** dialog box for Database Detect, all pre-existing interference checking processes are cleared from the database, and checking restarts from the beginning.

The server-based interference checking runs continuously. Therefore, you can perform an interference check at any time and view the interferences of interest that result from the background check by refreshing the workspace. After you have reviewed the interferences, you can remove an interference automatically from the database by editing the objects so that the interference no longer exists. You can then see the results of your edit by refreshing the workspace. Because certain types of interferences are allowable, you also have the capability to mark such interferences as acceptable.

Be aware that there is a four minute interval between the time you make your edits and the time that the database detect service rechecks the objects. After the database detect process reaches 100%, the software issues a query only every two minutes to locate newly modified objects. Therefore, it is possible that there is a six minute delay before a modified object is processed. We do not recommend changing the default four minute interval. However, if you are in **Project Management** with the **Interference Server Setting** dialog box open, press CTRL+SHIFT+F12 to change the default four minute interval.

NOTE You must run the Database Detect process before running an interference report. The report is not intended to run on local interferences.

What do you want to do?

- *Install Database Interference Detection Service* (on page 14)
- *Services Authentication Settings* (on page 14)
- *Configure Interference Service Properties* (on page 15)
- *Start the Database Interference Detection Service* (on page 15)
- *Set IFC Permission Requirements* (on page 16)
- *Create IFC Permission Group Folder and Permission Group* (on page 17)

- *Set IFC Permissions* (on page 17)
 - *Check Database Interferences* (on page 18)
-

Install Database Interference Detection Service


Prior to installing the Database Interference Detection Service on a computer, verify that all prerequisite software has been installed. If you have an older version of the Database Interference Detection Service installed on your computer, remove it before loading the new software.

You must have administrator privileges on the computer to install the software.

1. Open **Control Panel**.
2. Open **Programs and Features**.
3. Select **Intergraph Smart 3D** from the list of installed software's.
4. Click **Change**.
5. Select **Database Interference Detection Service**.
6. Optionally, select **64-bit Services** if you want to install the 64-bit version of the interference detection service also.

★ **IMPORTANT** If you are running Oracle, you must install the 64-bit Oracle client on the computer running 64-bit interference detection.

7. Click **Update**.


 **NOTE** If you have not yet installed Smart 3D on the computer, see *Install Smart 3D Client Software* in the installation guide for detailed instructions.

See Also

Interactive Interference Checking (Local Detect) (on page 25)

Services Authentication Settings

The **Database Authentication Settings - Services** utility defines the location of the database users ini file on the computers running the interference checking service, the naming rule service, and batch services. Because these three services use logins defined in the service itself and not the active Windows OS login, you must run this utility as an administrator on the computer. This action allows the services to find and access the database users ini file.

 **NOTE** You do not need to run this utility if you are using Windows Authentication to access the databases. For more information on creating the ini file, see *Create Database Login ini File*.

1. Right-click `..\Smart3D\ProjectMgmt\Tools\bin\ServicesAuthenticationSettings.exe`, and then select **Run as administrator**.
2. Select the database server type.
3. Select **Database User Authentication**.
4. Define the location and file name for the ini file to use.
5. Click **OK**.

Configure Interference Service Properties

1. Click **Start > All Programs (All Apps for Windows 10) > Intergraph Smart 3D > Database Tools (Windows 7 only) > Configure Interference Checking Service**.
2. In the **Configure Interference Service** dialog box, select your database type.
3. Select the site database server (Microsoft SQL Server) or the Oracle Service for the site database.
4. Select the site database on which the interference service is to run.
5. Click **OK**.

Start the Database Interference Detection Service

Prior to starting the Database Interference Detection Service, you must configure its properties. For more information, see *Configure Interference Service Properties* (on page 15).

1. Log on with Administrative privileges to the computer on which the **Project Management** and **Database Interference Detection Service** options are installed.
2. Open the **Control Panel**, and then double-click **Administrative Tools**.
3. In the **Administrative Tools** window, double-click **Services**.
4. Right-click either the **Smart 3D Interference Detection Service** or the **Smart 3D Interference Detection Service 64-bit**, and then select **Properties** from the shortcut menu.

★ **IMPORTANT** The 64-bit Smart 3D Interference Detection Service does not process Point Clouds. Use Reference 3D if you are running 64-bit IFC, or you can switch to a 32-bit IFC server to process Point Clouds.

5. On the **Log On** tab, select the **This account** option, and then type the user name that has Administrative privileges.

📘 **NOTE** This version of the software does not support the **Local System account** option.

6. In the **Password** and **Confirm password** boxes, type the password for the user account.
7. On the **Recovery** tab, set the **First failure**, **Second failure**, and **Subsequent failures** options to **Restart the Service**.
8. Set **Restart service after** to a minimum of 6 minutes.
9. On the **General** tab, verify that the **Startup type** is set to **Automatic**.
10. In the **Service status** section, click **Start**.
11. Click **OK**.

📘 **NOTES**

- The interference checking service does not consume a license when it starts. It consumes a license only while processing the model. For more information, see *Checking Interferences* (on page 7).
- Errors that are encountered during startup of the Database Interference Detection service are logged to the Event Viewer Application Log with the source name **IFCNTSvc**. The service can automatically recover from these situations:

- network interruptions
- lost database connection
- the interference checking process runs out of memory
- the interference checking process or service is terminated for any reason
- Do not run the 32-bit and 64-bit interference detection services simultaneously on a computer. IFC must only run as a single instance for the entire model.

Set IFC Permission Requirements

You must install the **Database Interference Detection Service** option in order to monitor interferences. For more information about installing and configuring this service, see the *Smart 3D Installation Guide* available from **Help > Printable Guides**.

★ IMPORTANT The user account running the IFC Windows service must have at least Read access to the SharedContent folder. Otherwise, IFC generates a bad part marker with clashes against structural fireproofing.

A Smart 3D Interference Detection Service icon is placed under the model node in the Project Management tree. After the proper access permissions are configured, you can start and stop the Database Detect process from any computer on which the Project Management option is installed.

The Smart 3D database hierarchy is comprised of a model configuration that consists of the model and catalog databases. For the IFC Database Detection process to run correctly, permissions must be set on the model and model permission groups according to the following guidelines:

Log on privileges for the IFC Administrator include:


- Read access on the model database at a minimum.
- Full Control permissions or access on a minimum of one permission group.

💡 TIP In the Project Management task, create a new permission group folder and permission group under the model icon to store the IFC results. For example, type **IFC Permission Group Folder** and **IFC Permission Group** in the **New Permission Group Folder** and **New Permission Group** dialog boxes, respectively. For more information, refer to *Create IFC Permission Group Folder and Permission Group* (on page 17).

- Read access on all other model database permission groups at a minimum.

Create IFC Permission Group Folder and Permission Group

1. Log on with administrative privileges to the computer where you have installed the **Project Management** and **Database Interference Detection Service** options.
2. In the Project Management tree view, navigate to the models icon.
3. Expand the models folder.
4. Right-click a model under the models folder, and select **New Permission Group Folder** on the shortcut menu.
5. Type **IFC Permission Group Folder** for the name of the new permission group folder.
6. Click **OK** to close the **New Permission Group Folder** dialog box.
7. In the tree view, navigate to the **IFC Permission Group Folder** icon.
8. Right-click the **IFC Permission Group Folder**, and select **New Permission Group** on the shortcut menu.
9. Type **IFC Permission Group** for the name of the new permission group.
10. Click **OK** to close the **New Permission Group** dialog box.

 **NOTE** After the IFC permission group is created, you must assign the proper access permissions. For more information, see *Set IFC Permissions* (on page 17).

Set IFC Permissions


1. Log on with administrative privileges to the computer on which the **Project Management** and **Database Interference Detection Service** options are installed.
2. In the Project Management tree, navigate to the **IFC Permission Group** icon.
3. Right-click the **IFC Permission Group** icon, and select **Permissions**.
4. On the **Access Permissions** dialog box, click **Add**.
5. In the **Add names** grid, double-click in the **User** cell, and type the domain and name of the user or group to add.

TIPS

- You can also click **Add** and search for users using the **Select Users and Groups** dialog box. This is a common Windows dialog box. For information regarding the options in this dialog box, see your Windows documentation.
 - To remove a user or group from the **Add names** grid, select the appropriate row, and then click **Remove**.
6. In the **Type of access** list, select the type of access you want to assign. The software automatically updates the associated row in the **Add names** grid.
 7. Click **OK**.
 8. Click **OK** again to close the **Access Permissions** dialog box.

Check Database Interferences

Before performing the following procedure, you must first manually configure the Smart 3D Interference Detection Service on the computer with the service installed. For more information, see *Configure Interference Service Properties* (on page 15).

1. In the Project Management tree, right-click the **Interference Server** icon  under the model for which you want to start Database Detect. Then select **Properties** on the shortcut menu.

2. In the **Interference Server Settings** dialog box, assign interference checking priorities to aspects.

TIP **Maintenance**, for example, is a typical aspect listed in the **Aspect** column. If a check of this aspect is important, you can indicate the priority as **Required**. If **Maintenance** is low priority or not important, you can indicate the priority as **Optional** or **Not Checked**.

3. Specify the interference comparison criteria:
 - **Required - Required** - Defines interferences classified as hard/hard. For example, one pipe physically intersects with another pipe. Severe interferences are shown in red.
 - **Required - Optional** - Defines interferences that are not as severe and are classified as hard/soft. For example, one pipe overlaps the optional aspect of the other object. Optional interferences are shown in yellow.
 - **Optional - Optional** - Defines interferences that are not severe and are classified as soft/soft. For example, the maintenance aspect of one piece of equipment overlaps the maintenance aspect of another. Optional interferences are shown in yellow.
 - **Smart 3D - External Data** - Considers objects outside the active model for interferences. For Local Detect, this option is enabled by default. For Database Detect, this box must be checked if you want attached Reference 3D models, inserted MicroStation and AutoCAD files to be considered. This option only checks objects against objects in external references and also checks for interferences between two external R3D objects.
 - **Smart 3D - Point Cloud** - Considers Smart 3D objects and point cloud objects for interferences. For Database Detect, this option must be selected to consider Smart 3D objects and point cloud objects. For Local Detect, select the **Smart 3D Point Cloud** check box to consider local interferences. The point cloud must have a valid connection to the model with no unresolved vendor licensing issues for this check box to be available.
4. In the **Include clearance** list, select the needed clearance rule. Clearance interferences are shown in green.
5. From the **Assign results to permission group** box, choose the permission group to which all the detected interferences are assigned.
6. In the **Marker size** field, type the value for the size of the interference symbols that generate in the model.

TIP Choose a marker size that is clearly readable, but one that does not interfere with the smaller details in the workspace view.

- Click **Start** on the **Database Detect** tab. After you click **Start**, the **Status** tab on the **Interference Server Settings** dialog box displays the progress of the processing for parts that existed previously and for new or changed parts during the run.

★ **IMPORTANT** If the IFC Server detects that your system resources are too low (due to a significant process requiring the majority of system memory), then the IFC process stops and displays a message box notifying you that the service has stopped for this reason. The IFC process will automatically attempt to restart when it runs out of memory.

NOTES


- The Smart 3D Interference Detection service does not consume a license when it starts. It consumes a license only while processing the model. For more information, see *Checking Interferences* (on page 7).
- To start the server interference detection process, you must have at least Read access to all objects in the model and Write access to the model itself. Access privileges are assigned for each permission group in the Project Management task. During the IFC process, if the software denies access to an object, the server process stops and a message appears.
- To view the status of the database interference detection process, right-click the **Interference Server** icon in the Project Management tree, and click **Properties**. On the **Interference Server Settings** dialog box, click the **Status** tab.
- When the database interference check process is running, only the **Stop** command is available. When the process is not running, the **Start** command and all process property gadgets are available. The **Stop** command is not available.
- When the database interference check is running and you add any permission group without Read permissions for the server, the server automatically receives Read permissions and finds collisions with the placed objects in that permission group.
- When you modify permission groups in Project Management, the host for the existing, running task does not receive the changes. To update the information, you must exit and restart the interference detection process.


See Also

Interference Server Settings Dialog Box (on page 20)

Update the ProglD of the Post Processor Rule

When the **Post Processor** rule compiles with a new ProglD on a project where the IFC was previously using a different **Post Processor** rule ProglD, or when you modify the ProglD of the IFC rule in the catalog through a bulkload, you must update the ProglD of the **Post Processor** rule in the model database with an SQL update query.


- In the symbol share, locate the new IFC rule DLL.
- Open Project Management.
- Right-click the **Interference Server** icon  and select **Properties**.
*The **Interference Server Settings** dialog box displays.*
- Under **Database Detect**, click **Stop**.
- Click **Tools > Update Custom Symbol Configuration**, and select **Update Custom Symbol Configuration**. For more information, see *Create or Update the Custom Symbol Configuration File* in the *Smart 3D Project Management User's Guide*.

6. Bulkload the new **Post Processor** rule.
The IFC rule is now defined by the ProgID in the catalog database, but the IFC rule in the model database still refers to the old ProgID.
7. In Project Management, right-click the **Interference Server** icon  and select **Properties**.
*The **Interference Server Settings** dialog box displays.*
8. Under **Database Detect**, click **Start**.
The ProgIDs are now updated, and Interference Checking performs as specified.

Interference Server Settings Dialog Box

Sets the properties associated with the selected interference server:

- Changes or accepts the default properties for the interference marker size.
- Checks the status of those interferences.
- Assign interference checking priorities to aspects and indicate whether the interferences are optional or required.
- Optionally, you can indicate if you want interference checking to include a clearance rule.

This dialog box is available by clicking **Properties** , **Edit > Properties**, or right-clicking the interference server in the Project Management tree.

If you change any of the options on the **Database Detect** tab and then click **Start**, the software displays a message box asking if you want to recheck the entire model while preserving the existing approved interferences.

NOTE The GSCADFoulCheckCmds.cSetIFCForRestart custom command is available if you need to delete all preexisting interferences from the database and start checking from scratch. For more information, see *GSCADFoulCheckCmds.cSetIFCForRestart* (on page 23).

★ IMPORTANT The **Interference Server Settings** dialog box is only available on computers on which the **Project Management** and **Database Interference Detection Service** options are installed.

Database Detect Tab (Interference Server Settings Dialog Box) (on page 20)

Status Tab (Interference Server Settings Dialog Box) (on page 22)

Database Detect Tab (Interference Server Settings Dialog Box)

Provides options for assigning interference checking priorities to aspects, specifying the comparison methods, and optionally including a clearance rule. You can also assign the interference results to a selected permission group. All properties on this tab when viewed outside the Project Management task are read-only.

NOTE You must run Database Detect before running the delivered Interference report. The Interference report is not intended to run on local interferences.

Server

Specifies the name of the server on which the interference checking is processed for the identified model.

Property

Specifies each aspect that you want to check. Lists all the object aspects that are identified for use in the mode, such as **Simple physical**, **Detailed physical**, **Insulation**, and **Maintenance**. This includes system-defined aspects and custom aspects.

Type

Defines the checking you can apply to the selected aspect: **Required**, **Optional**, and **Not checked**. Choose the appropriate type for each aspect. **Not checked** means the selected aspect is not used for interference checking.

Compare

Specifies the types of comparisons to perform to find interferences.

- **Required - Required** - Defines interferences classified as hard/hard. For example, one pipe physically intersects another pipe.
- **Required - Optional** - Defines interferences that are not as severe and are classified as hard/soft. For example, one pipe overlaps the optional maintenance aspect of the other object but does not actually intersect the other object.
- **Optional - Optional** - Defines interferences that are not severe and are classified as soft/soft. For example, the maintenance aspect of one piece of equipment overlaps the maintenance aspect of another.
- **Smart 3D - External Data** - Includes Reference 3D models, referenced MicroStation objects, and 3D AutoCAD files in interference checking. For Local Detect, the software by default considers objects in Reference 3D models, MicroStation, and 3D AutoCAD files that are in the workspace.

NOTES

- This option only checks active model objects against R3D external objects. IFC also checks clashes between R3D objects belonging to different R3D projects. The option does not check for interferences between other external objects such as MicroStation to 3D AutoCAD.
- Reference 3D models that contain tessellated data take a significant amount of time for interference checking to process. For quicker IFC performance, set **Interference Detection** to **Do Not Participate**.
- **Smart 3D - Point Cloud** - Includes an attached point cloud during interference checking. The point cloud must have a valid connection to the model with no unresolved vendor licensing issues for this option to be available.

Include clearance rule

Specifies the clearance rule to add to the **Required** type of interference check.

Assign results to permission group

Specifies the permission group to which all the detected interferences are assigned. The list displays only those permission groups to which the server containing the interference checking software has write access.

Marker size

Specifies the size of the interference graphic marker. Choose a size that is clearly visible, but one that does not interfere with the smaller details in the workspace view.

Start

Begins the Local Detect interference checking process. This option is only available in the Project Management task.

Stop

Stops the Local Detect interference checking the process. This option is only available in the Project Management task.

Status Tab (Interference Server Settings Dialog Box)

Displays the status of the Database Detect process on the server. The status information includes the percentage of checking that has been completed, the amount remaining, when the process was started, and the estimated completion time.

The information on this tab is read-only.

Model

Displays the name of the model that is checked.

New and modified parts at process start

Displays the following time information for any new and modified parts after the process was started.

- **Last part modified** - Displays the date and time (mm/dd/yyyy hh:mm:ss) at which the last part was created or modified in the Model database.
- **Current range to** - Displays the date and time (mm/dd/yyyy hh:mm:ss) at which the last part modified was in consideration for interference checking.
- **From** - Displays the date and time (mm/dd/yyyy hh:mm:ss) at which the interference check completed checking the last part modified.
- **Elapsed time** - Displays the amount of time (hour, min, sec) during which the interference checking has been running for the new or changed parts.
- **Estimated completion** - Displays the amount of time (hour, min, sec) estimated until the interference checking process completes.

Process start

Displays the time (mm/dd/yyyy hh:mm:ss) the process started.

Existing parts at process start

Displays the following time information for existing parts when the process was started.

- **Current range to** - Displays the date and time (mm/dd/yyyy hh:mm:ss) at which the interference checking started for the existing parts.
- **From** - Displays the date and time (mm/dd/yyyy hh:mm:ss) at which the interference checking ended for the existing parts.
- **First part created** - Displays the date and time (mm/dd/yyyy hh:mm:ss) at which the first part was created in the database.
- **Elapsed time** - Displays the amount of time (hour, min, sec) during which the interference checking has been running for the existing parts.

- **Estimated completion** - Displays the amount of time (hour, min, sec) estimated until the interference checking process completes.

Status message

Displays textual information about the current status of the process on the server.

GSCADFoulCheckCmds.cSetIFCForRestart

Replaces the Interference Checking Restart functionality. The ProgID for this command is GSCADFoulCheckCmds.cSetIFCForRestart. No arguments are required. You must first select a model in Project Management before you can run this custom command.

This command deletes all interferences in the selected model. It then configures IFC to start in **Warm Reboot** mode the next time you start IFC through the **Interference Server Settings** dialog box. For more information, see *Interference Server Settings Dialog Box* (on page 20).

This command displays a warning that it is about to delete all interferences in the model. If you click **Yes** on the warning dialog box, the command executes and then displays a message indicating that the process is complete.

NOTES

- This command is only available in the Project Management task.
- You must stop the IFC process before running this command.
- You cannot undo this command.
- The permissions required to run this command are the same as those required to start IFC.
- You cannot run this command from satellite locations in global workshare configurations.

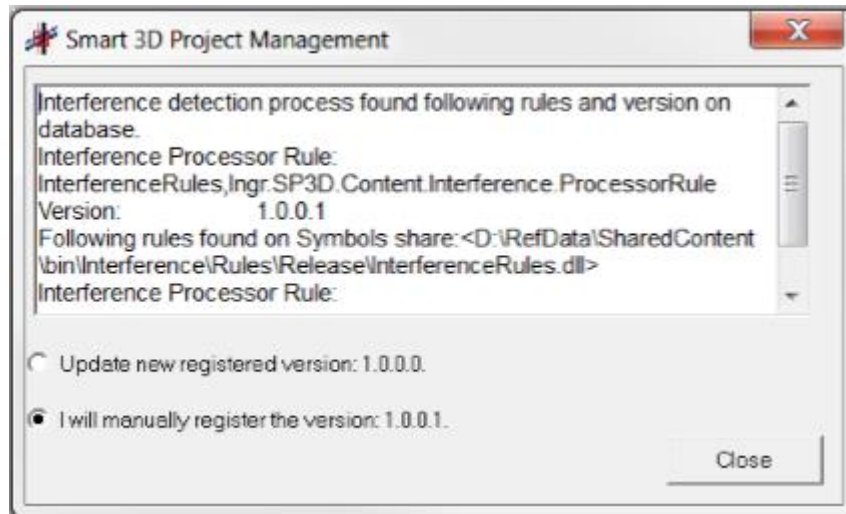
Smart 3D Project Management Dialog Box

The **Smart 3D Project Management** dialog box works in conjunction with the pre-processor rule to provide two basic features:

- It displays when a pre-processor rule error has been encountered. You can then correct the problem and continue.
- It provides a **Warm Reboot** option that enables you to save your existing approved fouls and automatically reprocesses the entire model.

Display Options Upon Encountering an Error

The information below in the **Smart 3D Project Management** dialog box displays when you click **Start** on the **Interface Server Settings** dialog box and a pre-processor rule error has been encountered.



Update new registered version

Enables IFC to automatically update the value in the database when a restart or warm reboot of IFC is performed. This option is disabled if a missing file was encountered.

I will manually register the version

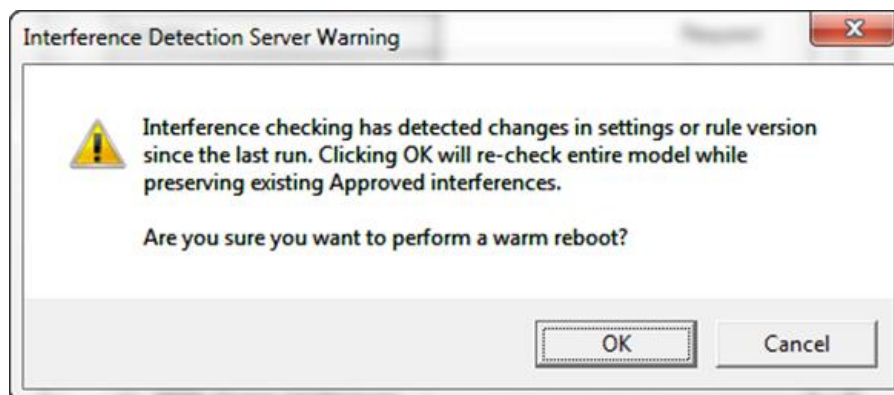
Verify that the correct version of the rule dll is in \\[*Reference Data Server*]\SharedContent\Custom Symbols, and then run the **Update Custom Symbol Configuration** command in Project Management.

Close

Returns you to the **Interference Checking** dialog box, or displays the reboot/restart options.

Display Options for Reboot

When a rule version mismatch is encountered or when you have made a change to the interference server settings, the following message displays:



OK

Updates the currently-registered IFCRule version in the database. IFC preserves existing approved fouls information and reprocesses the entire model.

Cancel

Ends any update processes and takes you back to the **Interface Server Settings** dialog box.

Interactive Interference Checking (Local Detect)

You can start and stop local interference checking from a user workstation. You can start the local interference checking by selecting the **Check Interference** command on the **Tools** menu. This action invokes the **Check Interference** ribbon, which provides all the tools required for setting up and running the local interference checking process.

When you run local interference checking, interferences are calculated on your workstation, not on the interference-checking server. Therefore, interactive and background interference checking processes can run simultaneously. Local interference detection is limited to checking objects that you create or edit while the Local Detect option is turned on. The status of the local interference check appears in the lower right corner of the application window.

Interactive interference checking provides real-time help through graphical feedback about potential interferences. You can see the interferences immediately after placing the object in the model. For example, when routing a pipe, the software checks interferences for that pipe after the commit to the database.


Because interactive interference checking occurs in real time, the interferences detected interactively are more current than those detected from background interference checking. You can view these background interferences from your workstation. If you have appropriate permissions, you can change the required action of the interferences.

Interactive interference checking only looks for interferences between objects in the active workspace. Hidden objects are not checked. Thus, what you see is what is checked for interferences. Interactive interference checking is not persistent. Therefore, if you close and open or refresh the session file, all the local interferences are removed. However, when you refresh the session, your local interferences become part of the Model database if server-based interference checking is running on the same model.

Run Clash Detection Interactively on a Select Set

You can use the **S3DFoulCheckCmds.CForceLocalIFCCommand** custom command to process a defined workspace for interference. This command does the following:

- If there is a select set, processes all of the selected objects for clashes against other objects in the workspace, including those objects in the select set.
- If there is no select set, processes the entire workspace for clashes.
- Turns on the local interference detection to initialize the Local IFC engine.
- Honors your clash detection settings.

 **NOTE** This custom command clears any existing local clashes in the workspace, but does not change the remote clashes created by the IFC remote engine.

Check Interference Command

Checks the database or your workspace to verify that parts do not occupy the same volumetric space and that each part meets the design criteria for clearance. A successful interference check assures that there is sufficient space around the parts so that they can operate or be serviced properly, and be easily installed or removed when necessary. This command is available on the **Tools** menu.

Check Interference Ribbon

Provides the following options related to the interference checking process at your workstation.

Settings

Displays the **Interference Checking Settings** dialog box. This dialog box allows you to specify the properties for the **Local Detect** interference. For more information, see *Interference Checking Settings Dialog Box* (on page 30). The **Database Detect** properties must be configured at the server in the Project Management task.

Show Interferences

Displays the types of interferences you specified on the **Display** tab of the **Interference Checking Settings** dialog box. These are the interferences that may exist for the objects you select. For example, if you check **Clearance** as your interference type and **Edit** as the option for **Required Action** and then select four pipes in your workspace on which to run the interference check, the software displays only **Clearance** interferences for those four pipes when you select the **Show** command. If you do not select any parts, then interferences appear for all parts in the workspace.

Hide Interferences


Hides the interferences that exist for the currently selected parts. If you do not select any parts, then all interferences in the workspace are hidden. All **Local Detect** interferences in the workspace are automatically hidden when you select this option. For example, if four **Database Detect** and two **Local Detect** interferences appear and you select two of the **Database Detect** interferences to hide, the two **Database Detect** interferences you selected and all of the **Local Detect** interferences are hidden. Thus, your workspace contains only two cleared **Database Detect** interferences.

Fit Interferences

Fits the active graphic view to the parts that match the interference check criteria. For example, you might have six severe interferences and two of these interferences are between a pump and a boiler. If you select this pump and boiler and then click the **Fit** command on the **Check Interference** ribbon, the software fits only these two parts into the graphic view. If you do not select any of the six interferences, the **Fit** command is unavailable.

Refresh Reference 3D Interferences

Retrieves interferences between Reference 3D (R3D) objects. This option is available when an external 3D reference model has been attached to the model. For more information, see *Reference 3D Model* in the *Project Management User's Guide*.

TIP Click **Refresh Workspace** , **File > Refresh Workspace**, or press **F5** to retrieve interferences between all Smart 3D objects and all other object types. This includes


interferences between Smart 3D and Reference 3D objects.

List View

Toggles the display of the **Interference List** dialog box. The list on this dialog box shows all interferences that currently appear in the workspace. The list automatically updates whenever you add an interference object to the workspace. You can add an interference from the **Local Detect** process, or when you select the **Refresh Workspace** or **Define Workspace** commands. For more information, see *Interference List Dialog Box* (on page 35).

Required Action

Displays the action required to deal with the selected interference. You cannot edit this option for local interferences.

 **TIP** The choices in the **Required Action** box are controlled by the **IFC Required Action** select list in the Catalog task. For more information about select lists, see the *Catalog User's Guide* available from the **Help > Printable Guides** command in the software.


Close


Closes the **Check Interference** ribbon.

What do you want to do?


- *Set interference checking parameters on a workstation* (on page 27)
 - *Control interference display* (on page 28)
 - *List interferences* (on page 29)
 - *Change required action* (on page 30)
 - *Display the interference status* (on page 30)
-

Set interference checking parameters on a workstation


1. If the **Check Interference** ribbon is not currently displayed, select **Tools > Check Interference**, then click **Settings**  to display the **Interference Checking Settings** dialog box.
2. On the **Display** tab, set the display for each type of interference and the type of interference that appears based on the required action.
3. You can edit the values on the **Local Detect** tab. For example, you can assign interference checking priorities to aspects.

 **TIP** **Maintenance**, for example, is a typical aspect listed in the **Aspect** column. If a check of this aspect is important, then you can indicate the priority as **Required**. If **Maintenance** is not as important, then you can indicate the priority as **Optional** or **Not checked**.

4. Specify the interference comparison criteria.

 **TIP** In Local Detect, the software considers foreign objects referenced in the workspace by default.

5. Specify a rule in the **Include clearance rule** box, if necessary.


6. Specify the interference marker in the **Marker size** box.
7. When you have completed all your settings, click **Apply** and **OK** on the **Local Detect** tab.
8. To view the current interferences list, click **List View** .

Control interference display

You can control the display of interferences with the **Check Interference** command. If interactive interference checking is not already running, click **Tools > Check Interference**.

Notice the three display-related buttons  on the **Check Interference** ribbon.

Hide Interferences

1. To hide interferences, select the interference objects that you want to hide.
2. Click **Hide Interferences**  on the **Check Interference** ribbon.

NOTES

- If you have not selected any objects to hide when you click this command, the software hides all the interferences in the model.
- You can clear acceptable interferences from your workspace by changing the required action and then editing the display properties for interferences. For example, in the **Required Action** column of the **Interference List**, select **None - Ignore the interference**. Then, clear the **None** box on the **Display** tab of the **Interference Checking Settings** dialog box.


Show Interferences

Click **Show Interferences**  on the **Check Interference** ribbon.


NOTE

- If you do not select any objects in the active view before clicking this command, the software displays the interferences for all parts in the workspace. To view interferences between specific objects, select these objects first and then click **Show Interferences**.

Fit Interferences

1. Select the interference objects you want to fit from the graphic view or from the interference list shown in the list view.
2. Click **Fit Interferences**  on the **Check Interference** ribbon.

List interferences

1. Select **Tools > Check Interference**.
2. Click **List View**  on the **Check Interference** ribbon.

TIPS

- You must have at least one interference in your workspace in order for the **List View** button to be available.
 - Double-click the **Row** button to view the properties for that interference. For more information, see *Interference Properties Dialog Box* (on page 37).
3. Review the list and edit rows as necessary. The following table provides a definition of each column property:

Column	Description	Instructions
Name	Name of the interference	Available only for Database Detect. You can edit the name from the Properties dialog box but not from the list view.
Part A	Name of the interfering part	Read only; you cannot edit.
Part B	Name of the interfering part	Read only; you cannot edit.
Type	Display of interference severity: Severe, Clearance, Optional.	Read only; you cannot edit.
Required Action	Provides a list with three choices: Undefined, Edit, None.	You can edit this box but not for interferences the local process detected.
Last Modified	Displays the date that the interference was found	Read only; you cannot edit.
Notes	Text entry field for other pertinent information	You can edit this box. Add additional information as needed. Does not apply to local interferences.

NOTES

- The **Interference List** automatically updates when you add an interference object to the workspace. This addition can be a local process interference, or database interferences loaded through the **Refresh Workspace** or **Define Workspace** commands. The software initially adds these additions to the bottom of the **Interference List**, but you can relocate them by sorting a column.
- Select a row in the **Interference List** to highlight the interference in the graphic views. The parts related to the interference also highlight.

Change required action

1. Select **Tools > Check Interference**.

The **Check Interference** ribbon appears.


2. In a graphic view or in the interference list view, select an interference.
3. On the ribbon, select an action in the **Required Action** box.

TIP The choices in the **Required Action** box are controlled by the **IFC Required Action** select list in the Catalog. For more information about select lists, see the *Catalog User's Guide* available from the **Help > Printable Guides** command in the software.

NOTES

- You can select the interfering objects from a graphic view or from the interference list. If you do not select any interferences, the **Required Action** box is unavailable on the ribbon.
- You can change the required action for database detect interferences but not for local interferences.

Display the interference status

1. Select **Tools > Check Interference**.
2. Click **Settings**  on the **Check Interference** ribbon.
3. Select the **Status** tab on the **Interference Checking Settings** dialog box to view the status of the Interference Checking process.

Interference Checking Settings Dialog Box

Provides options to change or accept the default properties for the interference marker size and the status of those interferences. Also, you can assign interference checking priorities to aspects and indicate whether the interferences are optional or required. Optionally, you can indicate if you want interference checking to include a clearance rule.

The **Interference Server Settings** dialog box at the server has two tabs: a **Database Detect** tab and a **Status** tab. However, the dialog box on your computer has four tabs: **Display**, **Database Detect**, **Local Detect**, and **Status**.

The **Status** tab provides current information on the progress of the Database Detect interference checking process running on the server. The progress of the Local Detect interference checking process appears at the bottom right corner of the application window when you are working in a task.

See Also

Check Interference Command (on page 26)

Database Detect Tab (Interference Server Settings Dialog Box) (on page 20)

Display Tab (Interference Dialog Box) (on page 31)

Local Detect Tab (Interference Dialog Box) (on page 33)

Status Tab (Interference Server Settings Dialog Box) (on page 22)

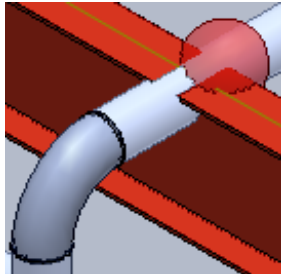
Display Tab (Interference Dialog Box)

Defines which interferences you want to view in the model. This tab does not appear on the server.

Type

Displays the following types of interference:

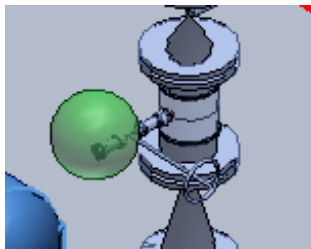
- **Severe** - Select if you want to display the most critical interferences. They represent situations where a piece of equipment overlaps another piece of equipment or a pipe interferes with a beam. The symbol that is slightly transparent red represents this type of interference.



- **Optional** - Select if you want to display optional interferences, interferences that you must decide whether or not to accept. For example, the maintenance area of one piece of equipment overlaps the maintenance area of another. The symbol that is yellow represents this type of interference.



- **Clearance** - Select if you want to display clearance interference, interferences where two or more pieces of equipment do not meet the specification clearance criteria. The symbol that is green represents this type of interference.



Required Action


Displays the following interference options based on their associated required actions:

- **Undefined** - Select if you want undefined types of interferences to appear.

- **Edit** - Select if you want unacceptable types of interferences to appear.
- **None** - Select if you want acceptable types of interferences to appear.

Database Detect Tab (Interference Server Settings Dialog Box)

Provides options for assigning interference checking priorities to aspects, specifying the comparison methods, and optionally including a clearance rule. You can also assign the interference results to a selected permission group. All properties on this tab when viewed outside the Project Management task are read-only.

 **NOTE** You must run Database Detect before running the delivered Interference report. The Interference report is not intended to run on local interferences.

Server

Specifies the name of the server on which the interference checking is processed for the identified model.

Property

Specifies each aspect that you want to check. Lists all the object aspects that are identified for use in the mode, such as **Simple physical**, **Detailed physical**, **Insulation**, and **Maintenance**. This includes system-defined aspects and custom aspects.

Type

Defines the checking you can apply to the selected aspect: **Required**, **Optional**, and **Not checked**. Choose the appropriate type for each aspect. **Not checked** means the selected aspect is not used for interference checking.

Compare

Specifies the types of comparisons to perform to find interferences.

- **Required - Required** - Defines interferences classified as hard/hard. For example, one pipe physically intersects another pipe.
- **Required - Optional** - Defines interferences that are not as severe and are classified as hard/soft. For example, one pipe overlaps the optional maintenance aspect of the other object but does not actually intersect the other object.
- **Optional - Optional** - Defines interferences that are not severe and are classified as soft/soft. For example, the maintenance aspect of one piece of equipment overlaps the maintenance aspect of another.
- **Smart 3D - External Data** - Includes Reference 3D models, referenced MicroStation objects, and 3D AutoCAD files in interference checking. For Local Detect, the software by default considers objects in Reference 3D models, MicroStation, and 3D AutoCAD files that are in the workspace.

NOTES

- This option only checks active model objects against R3D external objects. IFC also checks clashes between R3D objects belonging to different R3D projects. The option does not check for interferences between other external objects such as MicroStation to 3D AutoCAD.
- Reference 3D models that contain tessellated data take a significant amount of time for interference checking to process. For quicker IFC performance, set **Interference Detection** to **Do Not Participate**.

- **Smart 3D - Point Cloud** - Includes an attached point cloud during interference checking. The point cloud must have a valid connection to the model with no unresolved vendor licensing issues for this option to be available.

Include clearance rule

Specifies the clearance rule to add to the **Required** type of interference check.

Assign results to permission group

Specifies the permission group to which all the detected interferences are assigned. The list displays only those permission groups to which the server containing the interference checking software has write access.

Marker size

Specifies the size of the interference graphic marker. Choose a size that is clearly visible, but one that does not interfere with the smaller details in the workspace view.

Start

Begins the Local Detect interference checking process. This option is only available in the Project Management task.

Stop

Stops the Local Detect interference checking the process. This option is only available in the Project Management task.

Local Detect Tab (Interference Dialog Box)

Provides options for assigning interference checking priorities to aspects, specifying the compare methods, and optionally including a clearance rule.

Activate local interference detection

Starts the local interference checking process.

Assign interference checking priority to aspects

Select each aspect that you want checked and assign a priority to it.

- **Aspect** - Lists all the object aspects that are identified for use in the model. This includes the system-defined aspects and the user-defined aspects. Select those aspects in the **Aspect** column that apply to your objects, and then specify the type of comparison in the **Type** column.
- **Type** - Lists three types of checking you can apply to the selected aspect: **Required**, **Optional**, and **Not checked**. Choose the appropriate type for each aspect you select in the **Aspect** column. **Not checked** means the selected aspect is not used for interference checking.

Compare

Select which aspect types are to be compared against each other to find interferences.

- **Required - Required** - Defines interferences classified as hard/hard. For example, one pipe physically intersects another pipe.
- **Required - Optional** - Defines interferences that are not as severe and are classified as hard/soft. For example, one pipe overlaps the optional aspect of the other object but does not actually intersect the other object.

- **Optional - Optional** - Defines interferences that are not severe and are classified as soft/soft. For example, the maintenance aspect of one piece of equipment overlaps the maintenance aspect of another.

Include clearance rule

Specifies the clearance rule to add to the **Required** type of interference check.

Marker size

Specifies the size of the interference graphic marker. Choose a size that is clearly readable, but one that does not interfere with the smaller details in the workspace view.

Status Tab (Interference Server Settings Dialog Box)

Displays the status of the Database Detect process on the server. The status information includes the percentage of checking that has been completed, the amount remaining, when the process was started, and the estimated completion time.

The information on this tab is read-only.

Model

Displays the name of the model that is checked.

New and modified parts at process start

Displays the following time information for any new and modified parts after the process was started.

- **Last part modified** - Displays the date and time (mm/dd/yyyy hh:mm:ss) at which the last part was created or modified in the Model database.
- **Current range to** - Displays the date and time (mm/dd/yyyy hh:mm:ss) at which the last part modified was in consideration for interference checking.
- **From** - Displays the date and time (mm/dd/yyyy hh:mm:ss) at which the interference check completed checking the last part modified.
- **Elapsed time** - Displays the amount of time (hour, min, sec) during which the interference checking has been running for the new or changed parts.
- **Estimated completion** - Displays the amount of time (hour, min, sec) estimated until the interference checking process completes.

Process start

Displays the time (mm/dd/yyyy hh:mm:ss) the process started.

Existing parts at process start

Displays the following time information for existing parts when the process was started.

- **Current range to** - Displays the date and time (mm/dd/yyyy hh:mm:ss) at which the interference checking started for the existing parts.
- **From** - Displays the date and time (mm/dd/yyyy hh:mm:ss) at which the interference checking ended for the existing parts.
- **First part created** - Displays the date and time (mm/dd/yyyy hh:mm:ss) at which the first part was created in the database.

- **Elapsed time** - Displays the amount of time (hour, min, sec) during which the interference checking has been running for the existing parts.
- **Estimated completion** - Displays the amount of time (hour, min, sec) estimated until the interference checking process completes.

Status message

Displays textual information about the current status of the process on the server.

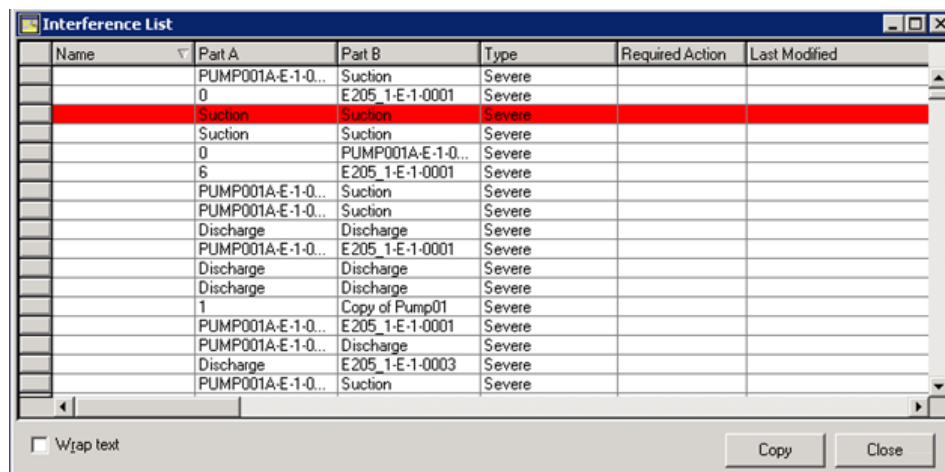
Interference List Dialog Box

Shows all the interferences that currently appear in the workspace. The list automatically updates whenever you add an interference object to the workspace. These interferences can come from the Local Detect process, or from database interferences loaded through the **Refresh Workspace** or **Define Workspace** commands. The software places the newly added interferences at the bottom of the list, where they remain until you sort them. You can view more columns and rows on the list by resizing the dialog box.

Pointing to a row in the list view highlights the row and simultaneously highlights the interference in your workspace.

Right-click a row to display the **Properties** for that row. For more information, see *Interference Properties Dialog Box* (on page 37).

You can alphabetize the interferences listed in the view by clicking the column header.



Click this button to select the interference in that row. Double-click this button to display the properties for the interference in that row.

Name

Displays the read-only name of the interference. This field is blank for local interferences.

Part A

Displays the read-only name of the first part involved in the interference.

Part B

Displays the read-only name of the second part involved in the interference.

Type

Displays a read-only status of the severity of the interference: **Severe**, **Clearance**, or **Optional**.

Required Action

Provides options for the action applied to the interference. You cannot edit the **Required Action** option for a local interference.

TIP The choices in the **Required Action** box are controlled by the **IFC Required Action** select list in the Catalog task. For more information about select lists, see the *Catalog User's Guide* available from the **Help > Printable Guides** command in the software.

Last Modified

Displays the read-only date the interference was found or updated. This field is blank for local interferences.

Notes

Provides a text box for typing comments about the interferences. For example, you can explain why you designated a certain interference as **Acceptable** or **Unacceptable**. This information can serve as a record of your actions. This field is blank for local interferences.

Wrap text

Wraps the text on this dialog box for easier reading.

Copy

Copies the selected rows to the clipboard. If you have no rows selected, this option copies all of the rows to the clipboard. This option copies the fields displayed on the dialog box, as well as the additional fields highlighted in the following figure:

B	C	D	E	F	G	H
{00004E2E-0000-0000-2305-7413B7541E04}	PUMP001A-E-1-0003	Simple physical	{00004E23-0000-0000-FD0E-7413B7541E04}	Suction	Simple physical	Severe
{00004E2E-0000-0000-AD05-7413B7541E04}	0	Simple physical	{00004E2E-0000-0000-5402-7413B7541E04}	E205_1-E-1-0001	Simple physical	Severe
{00004E23-0000-0000-2805-7413B7541E04}	Suction	Simple physical	{00004E23-0000-0000-6C00-7413B7541E04}	Suction	Simple physical	Severe
{00004E23-0000-0000-B90C-7413B7541E04}	Suction	Simple physical	{00004E23-0000-0000-6C00-7413B7541E04}	Suction	Simple physical	Severe
{00004E2E-0000-0000-AD05-7413B7541E04}	0	Simple physical	{00004E2E-0000-0000-2420-7413B7541E04}	PUMP001A-E-1-0017	Simple physical	Severe
{00004E2E-0000-0000-B806-7413B7541E04}	6	Simple physical	{00004E2E-0000-0000-5402-7413B7541E04}	E205_1-E-1-0001	Simple physical	Severe
{00004E2E-0000-0000-B40C-7413B7541E04}	PUMP001A-E-1-0007	Simple physical	{00004E23-0000-0000-6C00-7413B7541E04}	Suction	Simple physical	Severe
{00004E2E-0000-0000-F80E-7413B7541E04}	PUMP001A-E-1-0010	Simple physical	{00004E23-0000-0000-6C00-7413B7541E04}	Suction	Simple physical	Severe
{00004E23-0000-0000-3705-7413B7541E04}	Discharge	Simple physical	{00004E23-0000-0000-7D00-7413B7541E04}	Discharge	Simple physical	Severe
{00004E23-0000-0000-750C-7413B7541E04}	PUMP001A-E-1-0006	Simple physical	{00004E2E-0000-0000-5402-7413B7541E04}	E205_1-E-1-0001	Simple physical	Severe
{00004E23-0000-0000-C80C-7413B7541E04}	Discharge	Simple physical	{00004E23-0000-0000-7D00-7413B7541E04}	Discharge	Simple physical	Severe
{00004E23-0000-0000-0C0F-7413B7541E04}	Discharge	Simple physical	{00004E23-0000-0000-7D00-7413B7541E04}	Discharge	Simple physical	Severe
{00004E2E-0000-0000-E505-7413B7541E04}	1	Simple physical	{00004E2E-0000-0000-641C-7413B7541E04}	Copy of Pump01	Simple physical	Severe
{00004E2E-0000-0000-F80E-7413B7541E04}	PUMP001A-E-1-0010	Simple physical	{00004E2E-0000-0000-5402-7413B7541E04}	E205_1-E-1-0001	Simple physical	Severe
{00004E2E-0000-0000-F80E-7413B7541E04}	PUMP001A-E-1-0010	Simple physical	{00004E23-0000-0000-7D00-7413B7541E04}	Discharge	Simple physical	Severe
{00004E23-0000-0000-7D00-7413B7541E04}	Discharge	Simple physical	{00004E2E-0000-0000-841D-7413B7541E04}	E205_1-E-1-0003	Simple physical	Severe
{00004E2E-0000-0000-2305-7413B7541E04}	PUMP001A-E-1-0003	Simple physical	{00004E23-0000-0000-A901-7413B7541E04}	Suction	Simple physical	Severe
{00004E2E-0000-0000-5402-7413B7541E04}	E205_1-E-1-0001	Simple physical	{00004E2E-0000-0000-2B1C-7413B7541E04}	Pump01	Simple physical	Severe
{00004E2E-0000-0000-B40C-7413B7541E04}	PUMP001A-E-1-0007	Simple physical	{00004E23-0000-0000-A901-7413B7541E04}	Suction	Simple physical	Severe
{00004E2E-0000-0000-F80E-7413B7541E04}	PUMP001A-E-1-0010	Simple physical	{00004E23-0000-0000-A901-7413B7541E04}	Suction	Simple physical	Severe
{00004E2E-0000-0000-E505-7413B7541E04}	1	Simple physical	{00004E2E-0000-0000-2420-7413B7541E04}	PUMP001A-E-1-0017	Simple physical	Severe
{00004E2E-0000-0000-5402-7413B7541E04}	E205_1-E-1-0001	Simple physical	{00004E2E-0000-0000-641C-7413B7541E04}	Copy of Pump01	Simple physical	Severe

The columns in the figure display the following information:

- B - The object ID (OID) for the first object involved in the interference.
- C - The name of the first object involved in the interference. This column corresponds to the **Part A** box.
- D - The aspect of the first object that the software used for the interference checking.
- E - The object ID (OID) for the second object involved in the interference.

- F - The name of the second object involved in the interference. This column corresponds to the **Part B** box.
- G - The aspect of the second object that the software used for the interference checking.
- H - The type of interference that the software found. This column corresponds to the **Type** box.

Interference Properties Dialog Box

Sets options for a database interference. This dialog box also allows you to view any additional aspects involved in the interference and provides a box for you to add any explanatory notes. To access this dialog box, double-click a row button on the **Interference List** dialog box. For more information, see *Interference List Dialog Box* (on page 35).

NOTE The **Interference Properties** dialog box is available only for database interferences. Go to the **General Tab**, and click **Other Aspects** for all aspect interferences at the location. For local interferences, you can access the **Other Aspects** dialog box by double clicking the row button on the **Interference List**.

Topics

General Tab (Interference Properties Dialog Box)	37
Configuration Tab	38

General Tab (Interference Properties Dialog Box)

Category

Select the class of properties you want to view or edit.

Other Aspects

Displays a list of all aspect interferences for the interference. Because the interference checking process displays only the first aspect of interference at the location in the graphic view, this button allows you to check for all aspect interferences at that location. For more information, see *Other Aspects Dialog Box* (on page 39).

Name

Specifies the name of the interference.

Name rule

Specifies the naming rule to use for the interference.

Part A

Displays the name of the first part involved in the interference.

Aspect A

Displays the aspect of Part A that conflicts with the aspect of Part B.

Part B

Displays the name of the part that conflicts with Part A.

Aspect B

Displays the aspect of Part B that conflicts with the aspect of Part A.

Type

Displays the type of interference: **Severe**, **Optional**, or **Clearance**.

Check date

Displays the date the interference was located.

Required Action

Provides a box to accept the displayed option for the **Required Action** of the selected part. You can change the required action by selecting another option. This box is unavailable if the interference is from the Local Detect process.

Notes

Provides a box for typing comments about the interferences. For example, you can explain reasons for designating a certain interference as **Acceptable** or **Unacceptable**. This information can serve as a record of your actions. This box is unavailable if the interference is from the Local Detect process.

Configuration Tab

Displays the creation, modification, and status information about an object.

Model

Displays the name of the model. You cannot change this value.


Permission Group

Specifies the permission group to which the object belongs. You can select another permission group, if needed. Permission groups are created in the Project Management task.

Transfer

Reassigns ownership of the selected model objects from their current permission group to another satellite or host permission group. This button is only available if the active model/project is replicated in a workshare configuration. The button is not available if all of the objects in the select set already belong to another location and are non-transferable.

For more information, see *Transfer Ownership Dialog Box* in the *Common User's Guide*, available from the **Help > Printable Guides** command in the software.

 **NOTE** The **Transfer** option does not apply to the Surface Style Rules.

Status

Specifies the current status of the selected object or filter. Depending on your access level, you may not be able to change the status of the object.

Created

Displays the date and time that the object was created.

Created by

Displays the user name of the person who created the object.

Modified

Displays the date and time when the object was modified.

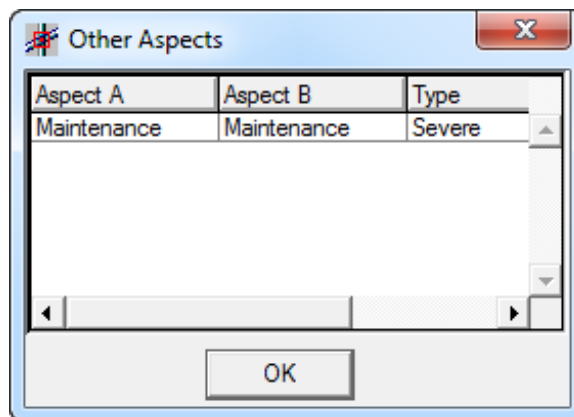
Modified by

Displays the user name of the person who modified the object.

Other Aspects Dialog Box

Provides a list of all object aspects involved in the interference. This dialog box appears when you click **Other Aspects** on the *Interference Properties Dialog Box* (on page 37). The interference checking process shows only the first aspect of interference in the graphic view. Click **Other Aspects** when you want to see all the aspects involved at the interfering location.

NOTE For local interferences, you can access this dialog box by double-clicking the row button on the **Interference List** dialog box.



Aspect Part A

Displays the aspect for part A that conflicts with the aspect for Part B.

Aspect Part B

Displays the aspect for part B that conflicts with the aspect for Part A.

Type

Displays the type of interference between the two aspects: **Severe**, **Optional**, or **Clearance**.

IFC Permissions at Satellite Locations

From Project Management at the host location, satellite users can be assigned *write* permission for the following interference checking (IFC) properties:

- Required Action
- Notes

No other properties are editable from a satellite location.

Required Action and **Notes** properties are accessible from the following places:

- **Interference List** dialog box

- **Interference Properties** dialog box
- **Local Interference Detection** ribbon

Interference List Dialog Box

The **Interference List** dialog box displays interferences from both the *Local Detect Tab* (*Interference Dialog Box*) (on page 33) process, and from database interferences derived from the Refresh Workspace or Define Workspace.

Name	Part A	Part B	Type	Required Action	Last Modified
	PUMP001A-E-1-0...	Suction	Severe		
0		E205_1-E-1-0001	Severe		
	Suction	Suction	Severe		
	Suction	Suction	Severe		
0		PUMP001A-E-1-0...	Severe		
6		E205_1-E-1-0001	Severe		
	PUMP001A-E-1-0...	Suction	Severe		
	PUMP001A-E-1-0...	Suction	Severe		
	Discharge	Discharge	Severe		
	PUMP001A-E-1-0...	E205_1-E-1-0001	Severe		
	Discharge	Discharge	Severe		
	Discharge	Discharge	Severe		
1		Copy of Pump01	Severe		
	PUMP001A-E-1-0...	E205_1-E-1-0001	Severe		
	PUMP001A-E-1-0...	Discharge	Severe		
	Discharge	E205_1-E-1-0003	Severe		
	PUMP001A-E-1-0...	Suction	Severe		

Interference Properties Dialog Box

Interference Properties

General | Configuration

Category: Standard [Other Aspects...]

Property	Value
Name:	nk001A-0002-MDB407-1-Tank:001A-0001
Name rule:	UniqueNameRule
Part A:	MDB407-1-Tank:001A-0002
Aspect A:	Maintenance
Part B:	MDB407-1-Tank:001A-0001
Aspect B:	Maintenance
Type:	Optional Interference
Check date:	4/14/2003 1:25:00 PM
Required Action:	Undefined - not yet reviewed

Notes:

Editable by Satellite

OK Cancel Apply

See Also

Interference List Dialog Box (on page 35)

Checking Interferences Common Tasks (on page 11)

Display the Interference Status (on page 30)

List Interferences (on page 29)

Set Interference Checking Parameters on a Workstation (on page 27)

See Also

Interference List Dialog Box (on page 35)

Checking Interferences Common Tasks (on page 11)

Display the Interference Status (on page 30)

List Interferences (on page 29)

Set Interference Checking Parameters on a Workstation (on page 27)

Assign IFC Permissions at Satellite Locations

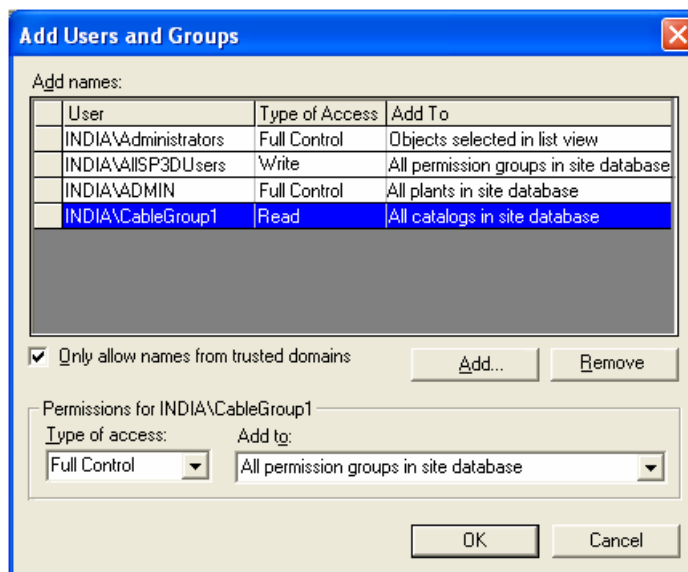
Satellite users who can edit interferences at satellite locations must have the following permissions:

- Write permission at the satellite location, that is, be a valid model user.
- Write permission to the IFC permission group at the host location.

No other properties are editable from a satellite location.

Permissions

The Host administrator can grant permissions to satellite users. If any satellite user is not from a trusted domain, the Host administrator clears the **Only allow names from trusted domains** check box in the **Add Users and Groups** dialog box. The host administrator then adds the corresponding user names.



For more information, see *Add Users and Groups Dialog Box* in *Project Management User's Guide*, available from the **Help > Printable Guides** command in the software.

SECTION 2

Interference Checking Reference Data

Interference checking reference 3D data consists of rules that control the interference checking process. The rules include pre- and post-processor rules, as well as a clearance rule.

You can customize the delivered IFC rules or create new IFC rules. For more information, see *Creating and Distributing IFC Rules* (on page 42).

See Also

IFC Clearance Rule Sheet (IFCRule.xls) (on page 42)

Creating and Distributing IFC Rules

The software makes it possible to create and customize the rules for interference checking. The process of customizing IFC rules is similar to the process for customizing the symbols. For more information, see the Visual Basic Symbols section in the *Smart 3D Symbols Reference Data Guide* available from the **Help > Printable Guides** command in the software.

See Also

IFC Clearance Rule Sheet (IFCRule.xls) (on page 42)

IFC Project (InterferenceRules.sln) (on page 43)

IFC Clearance Rule Sheet (IFCRule.xls)

The **IFCRule.xls** workbook contains a list of interference checking clearance rules. You can create new rules or modify the rules listed in **IFCRule.xls** to match your company construction and design standards. Any changes that you make to the rules do not take effect until you bulk load the new data to the Catalog and re-start the interference checking process.

The delivered **IFCRule.xls** can be found in the product folder: \CatalogData\BulkLoad\DataFiles. Some sheets in the **IFCRule.xls** workbook, such as the **Legend** sheet and the **Revision History** sheet, are common to all the workbooks. For more information on common sheets, see *Describing the Common Sheets in the Workbooks* in the *Smart 3D Reference Data Guide*.

The **IFC Clearance Rule** sheet in the **IFCRule.xls** workbook defines rules for clearances around object aspects. Clearances pertain to any object in the model that is a part. You can specify a clearance rule on the **Interference Checking Settings** dialog box available from the server or a workstation.

RuleName

Specifies a name for the rule. Each rule can have many sub-rules that control the clearance between objects and aspects. If you have sub-rules, you do not need to list the main rule name in each cell of the **RuleName** column.

ObjectType

Specifies the names that are used in the rule. Using the Metadata Browser application, you can find the object type under the object's classification node and the Username property. For example, for piping objects, **Pipes** are used in the rule; for structural beams, either **Member Part Linear** or **Member Part Curve** is used.

ObjectType1

Provides the type of object for the first object. Clearances are usually defined between two types of objects and their aspects. This sheet shows all the acceptable object type pairs on which the interference checking process can run.

Aspect1

Provides the aspect of the first object. Aspects are listed on the **Aspect Code** sheet in the **AllCodeLists.xls** workbook.

ObjectType2

Provides the type of object for the second object. Clearances are usually defined between two types of objects and their aspects. This sheet shows all the acceptable object type pairs on which the interference checking process can run.

Aspect2

Provides the aspect of the second object. Aspects are listed on the **Aspect Code** sheet in the **AllCodeLists.xls** workbook.

Clearance


Specifies the clearance in millimeters.

IFC Project (InterferenceRules.sln)

The InterferenceRules.sln project is provided with Smart 3D and contains the following rules that you can modify to match your company construction and design standards.

- **ProcessReference** – Determines if the input reference file should be checked for interferences
- **ProcessReferenceObject** – For those reference files which are being processed, each of its objects is passed to this rule to determine if it should be checked for interferences.
- **ProcessObject** – Determines if the input Smart> 3D object should be checked for interferences
- **IsValidInterference** – After two objects are determined to be interfering, this rule is called to determine if the interference should be persisted and to allow setting of properties on the interference object.

The InterferenceRules.sln project, written in C# programming language, is installed in the *[Programming Reference]\Interference* folder on your system. For more information about C# rules in the software, refer to the *Smart 3D Programmer's Guide*. This guide is available when you install the programming resources. For more information about installation, see the *Install Additional Product Software* section in the *Smart 3D Installation Guide*.

 **NOTE** Reference 3D models that contain tessellated data take a significant amount of time for interference checking to process. For quicker IFC performance, do not attach these models.

See Also

IFC Pre-Processor Rules Checking (on page 44)

ProcessObject Rule (on page 46)

IsValidInterference Rule (on page 47)

IFC Pre-Processor Rules Checking

When IFC encounters any object to be processed, it calls a pre-processor rule to allow for the exclusion of the object from interference checking. IFC processes the objects as per the rules specified in the pre-processor rule.

NOTES

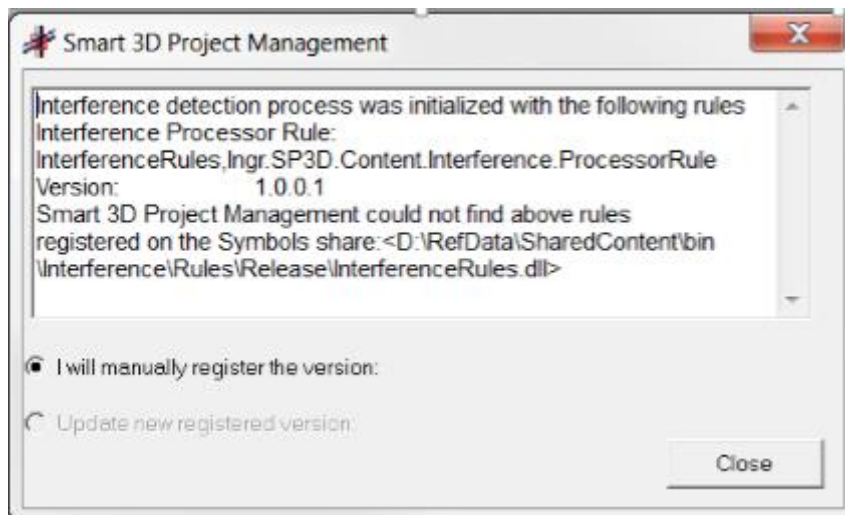
- Database Detect and Local Detect depend on the customized IFC Rule. This means that both server-based interference checking and interactive interference checking process objects as per the rules specified in the pre-processor rule.
- After placing the IFC Rule in the SharedContent folder, you may optionally use the **Tools > Update Custom Symbol Configuration** command in the Project Management environment. This command enables you to update the information in the CustomSymbolConfig.xml file automatically.
- When IFC encounters a missing rule, any configuration setting changes, or a rule version mismatch, a **Warm Reboot** option is provided that enables you to update the database for clash detection without losing any valid, approved fouls.
- If you need to modify the rules, go to the InterferenceRules.sln project in the [Programming Resources]\Interference\Rules folder on your computer.

After you click **Start** from the **Interference Server Settings** dialog box, IFC checks the rule versions. If any errors are encountered, the information displays in the **Smart 3D Project Management** dialog box. The sections below describe the workflow in resolving rule errors.

Missing Rules

Follow the steps below if IFC starts and finds a missing rule in the SharedContent folder. This happens if you type the IFC Rule information in the [Reference Data Product Folder]\SharedContent\Xml\CustomSymbolConfig.xml file and rename it or do not place the IFC Rule correctly in the required SharedContent folder location.

- IFC prompts you to register the rule.

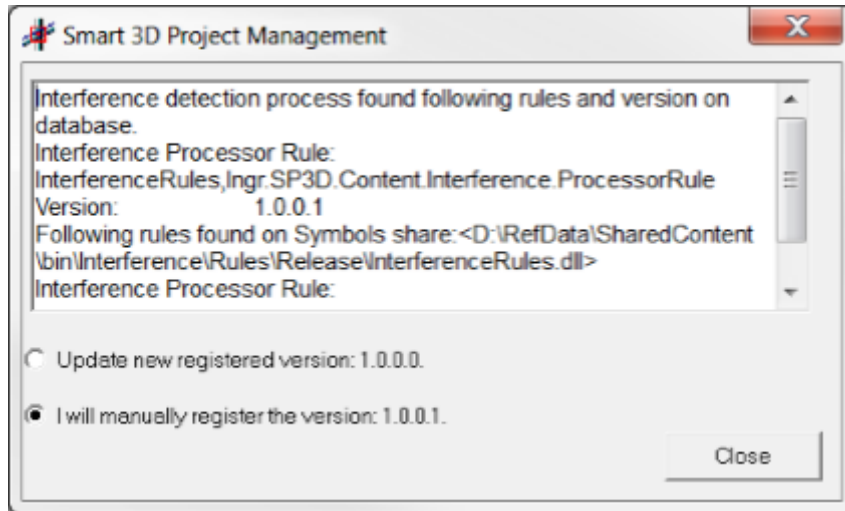


2. To resolve this issue, place the IFC Rule correctly in the SharedContent folder and then restart IFC. You will not see the above dialog box. IFC does not continue until the rule is copied correctly in the SharedContent folder in this case.

Rule Version Mismatch

Follow the steps below if IFC starts and encounters a rules version mismatch.

1. IFC prompts you to update the version or manually register the version.



2. Select one of the update options. See *Smart 3D Project Management Dialog Box* (on page 23).
3. Click **Close** to continue.
4. Click **Start** on the **Interference Checking Settings** dialog box.
5. Click either **OK** or **Cancel**.

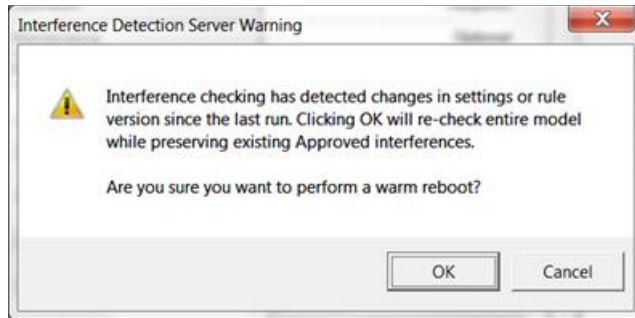
OK - Enables IFC to keep this new IFC Rule information in memory and the value is updated in the database. IFC preserves existing approved fouls information and reprocesses the entire model.

Cancel - Ends the version update session and takes you back to the **Interference Server Settings** dialog box.

IFC Settings Change

Follow the steps below if IFC starts and encounters changes in the IFC process settings.

1. IFC displays the message prompt below.



2. Click one of the provided reboot/restart options.

See Also

IFC Project (InterferenceRules.sln) (on page 43)

ProcessObject Rule

The ProcessObject rule is used to ignore specific Smart 3D object types for IFC processing. The type of input object can be accessed using the BOCinfo.Name property. The expected values can be found using the MetaData Browser. Note that IFC process parts but not features. For example, you can edit the object rule to ignore Piping Components, Pipes, and so forth. To modify this rule, open the InterferenceRules.sln project in the [Programming Reference]\Interferences\Rules folder on your system.

The code excerpt below is an example showing how you can set plate system objects to be ignored.

```
public override bool ProcessObject(InterferingObjectInfo objectA)
{
    //Sample on how to ignore objects based on the type of object. The code below
    //ignores PlateSystem objects. Change the BOCinfo.Name to ignore some other
    //objects. The names have to be an exact match

    if (objectA.BOCinfo.Name == "PlateSystem")
    {
        return false;
    }
    return true;
}
```

See Also

IFC Project (InterferenceRules.sln) (on page 43)

ProcessReference Rule

The ProcessReference rule enables you to avoid any known foreign files (MSTN, Reference3D, or ACAD) from the interference checking process. By default, IFC assumes the attached foreign files will participate in the IFC process (for server-based interference checking, the **Smart 3D-External Data** option must be selected). You can modify the ProcessReference rule to specify a file type or file path to filter out of the interference checking process. As shown in the code sample below, a return value of false indicates that the file will not be considered for interference checking process.

```
public override bool ProcessReference(Reference.SP3DReferenceFileType referenceType, string referencePath)
{
    if ( referencePath.StartsWith ( "\\sample\\SharedContent\\symbols\\storelay.dgn"))
    // Skip all files in a folder
        return false;
    else if ( referenceType == Reference.SP3DReferenceFileType.R3D )
    // Skip all R3D references
        return false;
    else if (referencePath.Contains( "Test.dwg")) // Skip a particular file
        return false;

    return true;
}
```

See Also

IFC Project (InterferenceRules.sln) (on page 43)

ProcessReferenceObject Rule

The ProcessReferenceObject rule enables you to skip processing of particular objects of a reference file. By default, IFC assumes the objects will participate in the IFC process. You can modify the ProcessReferenceObject rule to exclude certain objects from the foul checking process. The sample code below shows the exclusion of all R3D stair objects from the IFC process.

```
public override bool ProcessReferenceObject(InterferingObjectInfo referenceObject)
{
    BOCInformation bocInfo = referenceObject.BOCInfo;
    string strObjectType = bocInfo.Name;
    if (strObjectType == "Reference3DStair")
    {
        return false;
    }
    return true;
}
```

IsValidInterference Rule

Checks to determine if the detected interference should be considered valid. This rule is called when a new interference is detected and when an existing interference is being modified (modify).

- Create Interference (input existingClashBeingModified is false) - Triggered just after interference detection detects an interference and just before saving that interference to the database. This rule is to decide whether a user really needs this interference to be saved in the database. For example, industry practice is not to report the Insulation and Insulation interferences when two pipes are connected by an elbow. This rule also allows for user notes and allows a user to choose his own status for the interference.
- Modify Interference (input existingClashBeingModified is true) - Triggered when the interference detection process is trying to modify an interference because the parts participating in the collision were modified. Default implementation changes just the status and notes of an interference. You can see their properties and change/add/remove notes and the status of the interference. If after processing the function decides that this

interference is not valid, this function should return False to tell the system to remove the existing interference.

The sample code below shows skipping an interference if both participating objects are in the “GHOST” PG and updating an Interference’s remark when its type is Severe.

```
public override bool IsValidInterference ( Ingr.SP3D.Common.Middle.Interference interferenceObject,
InterferingObjectInfo interferringObjectA, InterferingObjectInfo interferringObjectB, bool existingClashBeingModified)
{
    //make sure first argument to objectBelongsToPG is all UPPPERCASE
    if (ObjectBelongsToPG("GHOST", interferringObjectA, interferringObjectB))
    {
        return false;
    }
    string appendNotes = "dummy comment";//If user adds any string here that will be appended to the IFC
    object.
    if(interferenceObject.Type == InterferenceType.Severe)
    {
        string existingRemark = interferenceObject.Remark;
        interferenceObject.Remark = existingRemark + appendNotes;
    }
    return true;
}
```

See Also

IFC Pre-Processor Rules Checking (on page 44)

Creating and Distributing IFC Rules (on page 42)

SECTION 3

Codeless IFC Rules

Interference rules that you customize using simple, text-based rules are called *codeless* IFC rules. You customize these rules in an XML configuration file instead of through code changes. Codeless IFC rules allow you to ignore objects for clash checking, ignore clashes between objects, and set clash properties.

Codeless IFC rule functionality is included in Smart 3D. Previously, this functionality was provided by Intergraph Services.


NOTES

- The ProgID is InterferenceRules.CodelessIFC. Previously, it was CodelessIFCRule.ProcessorRule.
- The configuration files are delivered in *[SymbolShare]\xml\Interference*. Previously, these files were delivered in *[SymbolShare]\CustomSymbols\ClashMgmt*.
- The configuration file supports a **Version** attribute to control Change Management.
- If the default configuration rule file does not exist, the software uses the Sample.CodelessIFCRules.config file to determine whether to process the object or interference.
- The bulkload file for installation, IFCRule.xls, is delivered in *[Product Folder]\CatalogData\BulkLoad\DataFiles*.

Setup

You must configure Codeless IFC Rules on one machine on which **Project Management** is installed.

1. Using **Windows Explorer**, navigate to *[SymbolShare]\xml\Interference*. Copy the Sample.CodelessIFCRules.config file to a file called *[YourModelName].CodelessIFCRules.config*.
2. Edit the *[YourModelName].CodelessIFCRules.config* file to configure the Clash Management Rules.
3. In **Project Management**, click **Stop** on the **IFC Database Detect** tab, and wait until the process finishes.
4. Navigate to *[Product Folder]\CatalogData\BulkLoad\DataFiles*, and open IFCRule.xls.
5. In the **IFCPostProcessorRule** worksheet on line 6, column A, replace the exclamation point (!) with the letter M.


 **NOTE** The **RuleProgID** column in line 6 displays InterferenceRules.CodelessIFC.

6. Bulkload the *[Product Folder]\CatalogData\BulkLoad\DataFiles\IFCRule.xls* file in AMD mode to set your model to use the **CodelessIFCRules** functionality.

Configuration File


After you modify the configuration file and bulkload the IFCRule.xls file, you can use the configuration file to specify which objects to ignore for clash checking during pre-processing. The configuration file allows you to specify the following post-processing rules for interference checking:

- Clashes to ignore based on the two objects involved in the clash
- Interface type (ignore, hard, or soft) for new or modified interferences

 **NOTE** You can augment the codeless IFC rule logic to invoke your own code-based custom IFC rule for pre-processing and post-processing. The software only runs the custom IFC rule if no rule in the configuration file is evaluated.


The configuration file is in XML format. Make sure you follow the guidelines listed below when you modify the file:

- The syntax is valid XML. XML tags are case sensitive.
- Tags and attributes use the format described in *Configuration File Format* (on page 52).

 **TIP** Notepad++ has an XMLTools plugin for detecting formatting errors.

Configuration File Change Management

The InterferenceCodelessRules.dll contains logic that interprets the configuration file rules. Therefore, any changes to the configuration file are equivalent to a change in logic. If you modify either the configuration file or the CustomIFCRule defined in the configuration file, you must decide whether the software must reprocess existing clashes.


 **IMPORTANT** Back up the configuration file and any revisions. We recommend setting standard Windows permissions to **Read** for all users and to **Modify** for model administrators.

A new rule for a future modeling scenario has no existing clashes. If you modify a rule that has processing or ignored clashes, you choose whether or not the software reprocesses the clashes.

Reprocess a clash

1. In Project Management, right-click the Interference Server node under the Model database, and then select **Properties**.
2. If the **Stop** button is available, click it to stop the IFC process, and then wait until it finishes.
3. Click **Close**, and then exit Project Management.
4. Open the configuration file, and increment the version number in the CustomClashRules node. For example, if the current version is 01.00.00.00, increment the number as follows:

```
<CustomClashRules Version="02.00.00.00"
```

 **NOTE** The software reprocesses clashes when a version changes.

5. In Project Management, right-click the Interference Server node under the Model database, and select **Properties**.

*The **Interference Server Settings** dialog box displays.*

6. Select **Update new registered version...** and then click **Close**.

7. Click **Start**.

The software displays a message box asking if you want to recheck the entire model while preserving the existing approved interferences.

Rule Development and Testing

The software reads the configuration file in a specific order to facilitate rule development and testing. For Server IFC, the configuration file is read once when the IFC detection process starts. For Local IFC, the configuration file is read each time you modify it.

Each time the software reads the configuration file, it writes a snapshot of the rules contained in the configuration file to a log file.

Test CodelessIFCRules changes before release

1. Copy the current configuration file to a file called `[YourModelName].CodelessIFCRulesTesting.config`.
2. Open a command prompt window, type the following command, and then press ENTER:

```
set CodelessIFCRulesTesting=TRUE
```
3. Type the name of your session file, including the full path (for example, `D:\TestMySession.ses`), and then press ENTER.
4. Use Local IFC detection to edit, test, and finalize the rules in the testing configuration file.
TIP Delete the clashing parts and perform an UNDO to re-evaluate local clashes.
NOTE If the configuration file contains formatting errors, the software displays an error message. You can make corrections and then proceed.
5. Update the main configuration file with the final tested changes, and reprocess existing clashes if necessary. For more information, see *Configuration File Change Management* (on page 50).

Logging

To enable logging of codeless IFC rules, create the following empty log files in the %TEMP% folder for each user login before you start the Server IFC and Local IFC:

- `ModelName.CodelessIFCRules.log` - for general user Local IFC
- `ModelName.CodelessIFCRulesTesting.log` - for the testing mode described in *Rule Development and Testing* (on page 51)
- `ModelName.CodelessIFCRules.ServerIFC.log` - for Server IFC mode

The software populates the log files as it processes clashes.

NOTE The `ModelName.CodelessIFCRules.ServerIFC.log` grows because the software appends rules each time it processes clashes. Either turn off logging before you start the Server IFC, or monitor the file size and disk space. If you need to keep the log, archive the log file and then empty it periodically.

Clash modification scenario log entry examples

Object is processed

```
@2/3/2015 4:54:13 PM - ProcessObject ? [Piping Components] -
'Flange-0403'
```

No rule is evaluated

```
ProcessObject -> Yes
```

Any rule is evaluated

```
--> Satisfied -
/CustomClashRules/IgnoreObjectsForClashChecking/ByObjectType[0]
--> <ByObjectType List="Piping Welds"/>
ProcessObject -> No
```

A clash is detected

```
@10/28/2014 12:44:10 AM - CreateInterference ? - [Slab] - 'Slab-
0101' & [Member Part Linear] - 'MemberPart-0202'
```

No rule is evaluated

```
CreateInterference -> Yes
```

Any rule is evaluated

```
--> Satisfied -
/CustomClashRules/IgnoreClashesBetweenObjects/ByObjectType[1]
--> <ByObjectType List1="Slab" List2="Member Part *"/>
CreateInterference -> No
```

The software also generates log entries for **SetClashType** and **SetClashProperty** rule evaluations.

Configuration File Format

The delivered example configuration file contains a high-level overview of the XML format.

The software evaluates rules in the order that results in the best performance. That is, faster rules are checked before more complicated rules with attributes that require more processing. For example, **ByObjectType** rules are examined first, followed by **ByName** rules, then **ByObjectPG** rules, and so on. Within each rule type, rules are executed in the order given in the configuration file. Anytime a rule is evaluated, the software skips the rest of the rules.

<CustomClashRules>

Supports an optional **Version** attribute for change management. Incrementing the version as shown in the following example forces IFC to reprocess the model with the updated rules. **<CustomClashRules>** is the root tag of the XML file.

Existing definition

```
<CustomClashRules Version="01.00.00.00">
```

Incremented version

```
<CustomClashRules Version="02.00.00.00">
```

NOTES

- `<CustomClashRules>` contains the child tags listed below. Each child tag is a group of rules.
 - `<IgnoreObjectsForClashChecking>`
 - `<IgnoreClashesBetweenObjects>`
 - `<SetClashProperties>`
 - `<AspectToUseForClashDetection>`
 - `<SetClashType`
- The `<IgnoreObjectsForClashChecking>`, `<IgnoreClashesBetweenObjects>`, and `<AspectToUseForClashDetection>` tags can also contain a `<CustomIFCRule>` tag.

`<IgnoreObjectsForClashChecking>`

Preprocessing rules that help determine if an object is to be ignored for clash checking. You can use one or more rules evaluating single object. For more information, see *Rules Evaluating a Single Object* (on page 57).


`<IgnoreClashesBetweenObjects>`

Post-processing rules that help determine if a clash between two objects is to be ignored. You can use one or more rules evaluating two clashing objects. For more information, see *Rules Evaluating Two Clashing Objects* (on page 63).

`<SetClashProperties>`

Sets the **ClashStatus** and **ClashRemarks** properties based on objects involved in a clash that evaluates the specified criteria. You can use one or more rules evaluating two clashing objects.

The rules under the `<SetClashProperties>` tag are similar to the rules under the `<IgnoreClashesBetweenObjects>` tag. If the rules under the `<IgnoreClashesBetweenObjects>` tag do not ignore a clash, then the software evaluates the rules under the `<SetClashProperties>` tag to determine if any rule has the required criteria. If a rule is evaluated, then the **ClashStatus** and **ClashRemarks** properties specified with the evaluated rule are applied to the clash.

 **NOTE** If the existing **ClashRemarks** value begins with 'L-', the software considers the value locked and the rule does not change the value.

Use at least one property (**ClashStatus** or **ClashRemarks**) with each `<SetClashProperties>` rule.

- **ClashStatus** - the status value to set on the clash. This value can be **Undefined**, **Edit**, **None**, or the equivalent codelist numeric value preceded with a colon (for example, `'1'`, `'2'`, or `'3'`, respectively).
- **ClashRemarks** - the remarks text set on the clash.

In the following example, the `<SetClashProperties>` rule and the **ClashStatus** and **ClashRemarks** properties specify that no action is needed for clashes between piping welds:

```

<SetClashProperties>
  <ByObjectType List1="Piping Welds" List2="Piping Welds"
    ClashStatus="None" ClashRemarks="weld/weld clashes need no
action"/>
</SetClashProperties>

```

<SetClashType>

Changes the clash category from the default value that is determined by internal rules according to the standard interference check behavior. You can use one or more **ByDefiningInterfacesAndAspect** rules in this section. The **ByDefiningInterfacesAndAspect** rules are described in the table below.

Rule Tag	Details
<i>ByDefiningInterfacesAndAspect</i>	
Sets the clash type based on the involved objects and aspects. You must specify the attributes listed in this table	
<i>Attributes</i>	
DefiningInterfacesList1 DefiningInterfacesList2	List of interfaces that limit the object1 type and object2 type; use an asterisk '*' to match all objects
Aspect1 Aspect2	The object1 and object2 aspect to match; you must define one aspect attribute
Type	Defines the ClashType ; specify HARD , SOFT , or IGNORE
Control	LimitToObjectTypes , ExcludeObjectTypes , ExcludeClashes , and RelationNavigationPath
<i>Example Rules</i>	
Example 1	
The following rule sets the piping physical aspect versus the equipment maintenance aspect to SOFT :	
<pre> <ByDefiningInterfacesAndAspect Type = "SOFT" DefiningInterfacesList1="IJRtePiping" Aspect1="Simple Physical" DefiningInterfacesList2="IJEquipmentFurnishings" Aspect2="Maintenance"/> </pre>	
Example 2	

Rule Tag	Details
	<p>The following rule sets any aspect of piping versus the operation aspect of any object to HARD:</p> <pre><ByDefiningInterfacesAndAspect Type="HARD" DefiningInterfacesList1 = "IJRtePiping" Aspect1="*" DefiningInterfacesList2 = "*" Aspect2="Operation"/></pre> <p>NOTE Use the LimitToObjectTypes option with wild cards to achieve the same results as those shown in Example 1 and Example 2</p> <p>Example 3</p> <pre><ByDefiningInterfacesAndAspect Type = "SOFT" DefiningInterfacesList1="*" Aspect1="Simple Physical" LimitToObjectTypes1="Pipes, Piping *" DefiningInterfacesList2="*" Aspect2="Maintenance" LimitToObjectTypes2="Equipment"/></pre> <p>Example 4</p> <pre><ByDefiningInterfacesAndAspect Type="HARD" DefiningInterfacesList1="*" Aspect1="*" LimitToObjectTypes1="Pipes, Piping *" DefiningInterfacesList2="*" Aspect2="Operation" LimitToObjectTypes2="*" /></pre> <p>Example 5</p> <p>The following rule sets member parts (Fireproofing Insulation) versus Anything (Physical) to HARD:</p> <pre><ByDefiningInterfacesAndAspect Type="HARD" DefiningInterfacesList1="*" Aspect1="*" LimitToObjectTypes1="Insulation" DefiningInterfacesList2="*" Aspect2="Simple Physical" LimitToObjectTypes2="*" /></pre>

<AspectToUseForClashDetection>

A rules section that overrides the aspects used for clash detection.

Rule Tag	Details
Sub-tags	
Default	The default aspect to use for objects in the clash calculation; Detailed physical is the default aspect
ByObjectType	A list attribute of ObjectTypes (attributes are separated by a comma), and an Aspect attribute that specifies the ObjectTypes aspect; the ByObjectType tag overrides the default aspect of an ObjectType

Rule Tag	Details
Example	<pre> <AspectToUseForClashDetection> <Default Aspect="Detailed physical" /> <ByObjectType List = "Pipe Supports, Duct Supports, Cable Tray Supports" Aspect="Simple physical"/> </AspectToUseForClashDetection> </pre>

<CustomIFCRule>

Applies programmatic rules you write if you cannot achieve a particular result using the codeless rules already contained in the configuration file. You can configure custom (VB6 or .NET) IFC Rule ProgIDs within the <IgnoreObjectsForClashChecking>, <IgnoreClashesBetweenObjects>, and <AspectToUseForClashDetection> sections.

1. Write a custom ProgID and implement the IFC rule interfaces (IJDInterferenceRule, IJDInterferencePrePrCSRRule, and IJDIntPrePrCSRRuleForeign).
2. Specify the custom ProgID in the ProgID attribute of the CustomIFCRule.
3. Run the custom IFC rule .dll in [SymbolShare]\Custom Symbols\Interference.
4. Run the **Update Custom Symbol Configuration** command in Project Management.

*If no text-based rule ignores your object or clash, and your object type contains the specified **[LimitTo or Exclude] ObjectTypes** or **ExcludeClashes** criteria, the software invokes the custom ProgID. If the custom ProgID returns false, then the object or clash is ignored.*

NOTES

- You can use screening criteria attributes to limit rule evaluation to a few **ObjectTypes**. If your custom code-based rule handles specific **ObjectTypes**, limit or exclude **ObjectTypes** and clashes from evaluation to improve software performance.
- For specific clash situations, specify multiple **CustomIFCRule** rules that have different screening criteria to define focused, separate coded rules that have separate ProgIDs. The software uses the first qualifying rule result it encounters. See the following example:


```

<CustomIFCRule ProgID="MyCustomIFCRule.ProcessorRuleA"
  LimitToObjectTypes="<specifyA1,2,3>"/>
<CustomIFCRule ProgID="MyCustomIFCRule.ProcessorRuleB"
  LimitToObjectTypes="<specifyB1,2,3>"/>

```




Rules Evaluating a Single Object

Evaluates a single object. Use these rules in the `<IgnoreObjectsForClashChecking>` section, and under `<ByIndividualObjectRules>` in both the `<IgnoreClashesBetweenObjects>` section and the `<SetClashProperties>` section. For more information, see *Configuration File Format* (on page 52).

Rule Tag	Details
ByObjectType Decision based on object's Type (BOC user name)	
Attributes	List - ObjectTypes in a comma-separated list
Examples	<ul style="list-style-type: none"> For piping welds: <code><ByObjectType List="Piping Welds"/></code> For member parts, piping parts, and welds: <code><ByObjectType List="Member Part *, Piping *"/></code>
ByName Decision based on object's Name	
Attributes	Equals - exact match Like - wild card match  NOTE The attribute must specify a matching value
Control	<ul style="list-style-type: none"> LimitToObjectTypes ExcludeObjectTypes
Examples	<ul style="list-style-type: none"> For objects that have 'Road' in the name: <code><ByName Like="*Road*"/></code> For objects that have 'Road' in the name; limited to equipment: <code><ByName Like="*Road*" LimitToObjectTypes="Equipment"/></code> For objects that have 'Road' in the name, excluding slabs: <code><ByName Like="*Road*" ExcludeObjectTypes="Slab"/></code>
ByObjectPG Decision based on the object's PG	
Attributes	List - must specify one or more PG names in a comma-separated list
Control	<ul style="list-style-type: none"> LimitToObjectTypes ExcludeObjectTypes RelationNavigationPath

Rule Tag	Details
Examples	<ul style="list-style-type: none"> For piping parts in SpecTest PG: <code><ByObjectPG List="Testing,GHOST"/></code> For objects in Testing or GHOST PGs: <code><ByObjectPG List="SpecTest" LimitToObjectTypes="Pipes, Piping Components, Piping INstruments, Piping Specialty Items"/></code> For any object in SpecTest PG except for MemberParts: <code><ByObjectPG List="SpecTest" ExcludeObjectTypes="Member Part Linear, Member Part Curve"/></code>
<i>ByRangeDiagonalLimit</i> Decision based on object's range diagonal size	
Attributes	Value - specify the limit of the range diagonal (for example, Value="100m")
Control	<ul style="list-style-type: none"> LimitToObjectTypes ExcludeObjectTypes
Examples	<ul style="list-style-type: none"> For slabs with a range greater than 100 meters: <code><ByRangeDiagonalLimit LimitToObjectTypes = "Slab" Value = "100m"/></code> For any object except for pipes that are greater than 100m in range: <code><ByRangeDiagonalLimit ExcludeObjectTypes = "Pipes" Value = "100m"/></code> For any object that is larger than 200m in range: <code><ByRangeDiagonalLimit Value = "200m"/></code>
<i>BySystemPath, ByParentSystemPath, ByAssemblyPath, ByParentAssemblyPath</i> Decision based on object's system path, system hierarchy parent's system path, assembly path, or assembly hierarchy parent's assembly path	
Attributes	<ul style="list-style-type: none"> Equals - exact match Like - wild card match
Control	<ul style="list-style-type: none"> LimitToObjectTypes ExcludeObjectTypes RelationNavigationPath
Example	<ul style="list-style-type: none"> For all objects under \Existing Roads in the system hierarchy: <code><BySystemPath Like = "*"\\ExistingRoads*"/></code>

Rule Tag	Details
ByInterfaces Decision based on object implementing the specified interfaces per metadata	
Attributes	List - specify one or more interface names in a comma-separated list; '*' is allowed
Control	<ul style="list-style-type: none"> ▪ LimitToObjectTypes ▪ ExcludeObjectTypes ▪ RelationNavigationPath
Examples	<ul style="list-style-type: none"> ▪ For sleeve-type specialty parts: <code><ByInterfaces List="IJUASleeve" LimitToObjectTypes="Piping Specialty Items"/></code> ▪ For all parts, except for footings, that implement IJUACircularPlatform: <code><ByInterfaces List="IJUACircularPlatform" ExcludeObjectTypes="Footing"/></code>
ByAttribute Decision based on a single attribute value of the object	

Rule Tag	Details																		
Attributes	<ul style="list-style-type: none"> ▪ Interface - the name of the interface that has the attribute ▪ Attribute - the attribute name in Smart 3D ▪ Operator - defines the comparison between the value in the configuration file and the value on the Smart 3D object; you must use one of the symbols or the equivalent text listed below: <table> <tr> <th>Symbol</th><th>Equivalent Text</th></tr> <tr> <td>=</td><td>EQ</td></tr> <tr> <td>></td><td>GT</td></tr> <tr> <td>>=</td><td>GE</td></tr> <tr> <td><</td><td>LT</td></tr> <tr> <td><=</td><td>LE</td></tr> <tr> <td><> !=</td><td>NE</td></tr> <tr> <td>~</td><td>Like</td></tr> <tr> <td>!~</td><td>NOT Like</td></tr> </table> <p> NOTE Because the greater-than (>) and less-than symbols (<) require an escape in XML, we recommend that you use the equivalent text (GT and LT)</p> <ul style="list-style-type: none"> ▪ Value - the value of the attribute to match; you can specify multiple values separated by a pipe symbol () for operators (EQ, NE, Like, or NOT Like) <p> NOTES</p> <ul style="list-style-type: none"> ▪ For codelisted attributes, specify either the short string values or codelist numbers (a codelist number must be preceded by a colon ':') ▪ You must specify units for united attributes ▪ Tolerance - only applicable for numeric values; use with units if applicable, or use DB units in comparison 	Symbol	Equivalent Text	=	EQ	>	GT	>=	GE	<	LT	<=	LE	<> !=	NE	~	Like	!~	NOT Like
Symbol	Equivalent Text																		
=	EQ																		
>	GT																		
>=	GE																		
<	LT																		
<=	LE																		
<> !=	NE																		
~	Like																		
!~	NOT Like																		
Control	<ul style="list-style-type: none"> ▪ LimitToObjectTypes ▪ ExcludeObjectTypes ▪ RelationNavigationPath 																		

Rule Tag	Details
Examples	<ul style="list-style-type: none"> For objects where ConstructionRequirement = Existing: <pre><ByAttribute Interface="IJConstructionInfo" Attribute="ConstructionRequirement" Operator="EQ" Value=":3" /></pre> For pumps with a shaft diameter less than 0.5in, optimized to only process equipment <pre><ByAttribute LimitToObjectTypes="Equipment" Interface="IJUAShaftDims" Attribute="ShaftDia" Operator="LT" Value="0.5in" Tolerance="1mm" /></pre> For all piping parts of NPD less than or equal to 0.5 in.: <pre><ByAttributes LimitToObjectTypes= "Piping Components, Pipes, Pipe Instruments, Pipe Specialty Items" RelationNavigationPath="IJRtePathGenPart%Owner[1]" Interface1="IJRtePipeRun" Attribute1="NPD" Operator1="LE" Value1="0.5" Interface2="IJRtePipeRun" Attribute2="NPDUnitType" Operator2="EQ" Value2="in"/></pre>
ByAttributes Decision based on multiple attribute values of the object	
Attributes	<ul style="list-style-type: none"> Interface - the name of the interface that has the attribute Attribute - the attribute name in Smart 3D Operator - the value in the config file and the value of the Smart 3D object <p>NOTES</p> <ul style="list-style-type: none"> This rule is similar to ByAttribute; for each Smart 3D attribute, you must specify the Interface, Attribute, Operator Value, and Tolerance (optional) To check two attribute values, specify the following XML attributes: <ul style="list-style-type: none"> Interface1, Attribute1, Operator1, Value1, RelationNavigationPath1 Interface2, Attribute2, Operator2, Value2, RelationNavigationPath2
Control	<ul style="list-style-type: none"> LimitToObjectTypes ExcludeObjectTypes RelationNavigationPath

Rule Tag	Details
Example	<p>Specifies that ConstrutionType = Temporary and No-MTO objects:</p> <pre><ByAttributes Interfacel="IJConstructionInfo" Attribute1="ConstructionType" Operator1="EQ" Value1=":6" Interface2="IJMTOInfo" Attribute2="ReportingType" Operator2="EQ" Value2=":2" Comment="Ignore 'Temporary' and 'No MTO' objects" /></pre>
ByFilePath Decision based on a file path for ignoring foreign reference files (MSTN, R3D, and so forth) NOTE The ByFilePath rule is only used in the IgnoreObjectsForClashChecking section	
Attributes	Equals or Like - specify a FilePath value to match Type - specify the fileType value to match (MSTN, for example)
Examples	<ul style="list-style-type: none"> For attached MSTN type reference files whose path contains \Roads\: <pre><ByFilePath Like="*\Roads*" Type="MSTN" /></pre> For attached MSTN type reference files by the given exact path, RefFiles\Grade\Ground.dgn: <pre><ByFilePath Equals="RefFiles\Grade\Ground.dgn" Type="MSTN"/></pre>
ByR3DProject, ByR3DFile Decision based on R3D objects that are based on the R3D project name or R3D file name	
Attributes	Equals or Like - specify a FilePath value to match
Control	<ul style="list-style-type: none"> LimitToObjectTypes ExcludeObjectTypes
Example	For R3D objects from a TestR3D project: <pre><ByR3DProject Equals="TestR3D"/></pre>
ByRulesCombination Decision based on a combination of single object rules NOTES <ul style="list-style-type: none"> You can group any of the single object rules under ByRulesCombination This rule is evaluated if all rules included under the ByRulesCombination tag are evaluated 	
Control	<ul style="list-style-type: none"> LimitToObjectTypes ExcludeObjectTypes


Rule Tag	Details
Example	<p>For underground pipes and components where the construction status is equal to Existing to be reused in place:</p> <pre> <ByRulesCombination LimitToObjectTypes="Pipes, Piping *"> <ByObjectPG List="Underground Piping"/> <ByAttribute Interface="IJConstructionInfo" Attribute="ConstructionType" Operator="EQ" Value=":17"/> </ByRulesCombination> </pre>



Rules Evaluating Two Clashing Objects

Evaluates two objects. Use these rules in the `<IgnoreClashesBetweenObjects>` section and in the `<SetClashProperties>` section to determine if the clash qualifies based on the criteria. For more information, see *Configuration File Format* (on page 52).



NOTE The syntax and functionality of rules that evaluate two objects are similar to the rules that evaluate single objects, although the rules for evaluating two objects expect criteria that evaluates **Object1** and **Object2**.

Rule Tag	Details
<i>ByObjectType</i>	Decision based on the Type for two objects (BOC User name)
Attributes	<ul style="list-style-type: none"> ▪ List1 - ObjectTypes in a comma-separated list ▪ List2 - ObjectTypes in a comma-separated list
Example	<p>For clashes that involve slabs and handrails:</p> <pre> <ByObjectType List1="Slab" List2="Handrails"/> </pre>
<i>ByObjectTypeAndAspect</i>	Decision based on ObjectType and Aspect of the two objects involved in the clash
Attributes	<ul style="list-style-type: none"> ▪ ObjectType1 - BOC username of object ▪ ObjectType2 - BOC username of object ▪ Aspect1 - clashing aspect of object ▪ Aspect2 - clashing aspect of object <p>NOTES</p> <ul style="list-style-type: none"> ▪ If ObjectType1 and ObjectType2 are identical, you can use ObjectTypes to consolidate the attributes ▪ If Aspect1 and Aspect2 are identical, you can use Aspects to consolidate the attributes


Rule Tag	Details
Examples	<ul style="list-style-type: none"> Rule written using all required attributes: <pre><ByObjectTypeAndAspect ObjectType1="Piping Welds" Aspect1="Maintenance" ObjectType2="Piping Welds" Aspect2="Maintenance"</pre> Because both ObjectType (1 and 2) attributes are identical and both Aspect (1 and 2) attributes are identical in the above example, you can write the rule more concisely using the ObjectTypes and Aspects attributes: <pre><ByObjectTypeAndAspect ObjectTypes="Piping Welds" Aspects="Maintenance"/></pre>
ByName Decision based on the two object Names	
Attributes	<ul style="list-style-type: none"> Name1Equals/Name1Like - specify a matching value Name2Equals/Name2Like - specify a matching value <p> NOTES</p> <ul style="list-style-type: none"> Both attributes must be specified with a value to match Equals requires an exact match Like permits the use of wild cards
Control	<ul style="list-style-type: none"> LimitToObjectTypes ExcludeObjectTypes ExcludeClashes
ByObjectPG Decision based on the PG of two objects	
Attributes	<ul style="list-style-type: none"> List1 - PG names in a comma-separated list List2 - PG names in a comma-separated list
Control	<ul style="list-style-type: none"> LimitToObjectTypes ExcludeObjectTypes ExcludeClashes RelationNavigationPath
Examples	<p>For clashes between member parts where at least one member part is in the GHOST permission group:</p> <pre><ByObjectPG List1="GHOST" List2="*" LimitToObjectTypes="Member Part *"/></pre>

Rule Tag	Details
<i>BySystemPath, ByParentSystemPath, ByAssemblyPath, ByParentAssemblyPath</i> Decision based on two objects' system path, system hierarchy parent's system path, assembly path, or assembly hierarchy parent's assembly path	
Attributes	<ul style="list-style-type: none"> ▪ Name1Equals/Name1Like - a matching value ▪ Name2Equals/Name2Like - a matching value <p> NOTES</p> <ul style="list-style-type: none"> ▪ Both attributes must be specified with a value to match ▪ Equals requires an exact match ▪ Like permits the use of wild cards
Control	<ul style="list-style-type: none"> ▪ LimitToObjectTypes ▪ ExcludeObjectTypes ▪ RelationNavigationPath
Example	<p>For clashes between piles (member parts under a system named Piles) and foundations (footing, footing component, and slab under a system named Foundation):</p> <pre><ByParentSystemPath LimitToObjectTypes1="Member Part *" LimitToObjectTypes2="Footing,Footing Component, Slab" Name1Like="*\Piles*" Name2Like="*\Foundation*" /></pre>
<i>ByInterfaces</i> Decision based on a clash involving two objects that implement the specified interfaces according to the metadata	
Attributes	<ul style="list-style-type: none"> ▪ List1 - interface names in a comma-separated list ▪ List2 - interface names in a comma-separated list <p> NOTE You can use wild cards to specify these attributes</p>
Control	<ul style="list-style-type: none"> ▪ LimitToObjectTypes ▪ ExcludeObjectTypes ▪ ExcludeClashes ▪ RelationNavigationPath

Rule Tag	Details
Example	<p>For clashes involving welds and piping parts using an interface approach:</p> <pre><ByInterfaces List1="IJRtePipeWeld" List2="IJRtePiping, IJRtePathGenPart" LimitToObjectTypes1="Piping Welds" LimitToObjectTypes2="Pipes, Piping *"/></pre>
<p><i>ByAttribute</i></p> <p>Decision based on property values (one each) of two objects</p> <p>NOTES</p> <ul style="list-style-type: none">▪ You cannot use the <i>ByAttributes</i> rule in a scenario where two objects clash▪ To decide based on multiple properties, use <i>ByRulesCombination</i> with multiple <i>ByAttribute</i> rules	

Rule Tag	Details																		
Attributes	<ul style="list-style-type: none"> ▪ Interface1 and Interface2 - the names of the interfaces that have the attributes ▪ Attribute1 and Attribute2 - the attribute names in Smart 3D ▪ Operator1 and Operator2 - defines the comparison between the value in the configuration file and the value on the Smart 3D object; you must use one of the symbols or the equivalent text listed below: <table> <tr> <th>Symbol</th><th>Equivalent Text</th></tr> <tr> <td>=</td><td>EQ</td></tr> <tr> <td>></td><td>GT</td></tr> <tr> <td>>=</td><td>GE</td></tr> <tr> <td><</td><td>LT</td></tr> <tr> <td><=</td><td>LE</td></tr> <tr> <td><> !=</td><td>NE</td></tr> <tr> <td>~</td><td>Like</td></tr> <tr> <td>!~</td><td>NOT Like</td></tr> </table> <p> NOTE Because the greater-than (>) and less-than symbols (<) require an escape in XML, we recommend that you use the equivalent text (GT and LT)</p> <ul style="list-style-type: none"> ▪ Value1 and Value2- the values of the attributes to match; you can specify multiple values separated by a pipe symbol () for operators (EQ, NE, Like, or NOT Like) <p> NOTES</p> <ul style="list-style-type: none"> ▪ For codelisted attributes, specify either the short string values or the codelist numbers (codelist numbers must be preceded by a colon ':') ▪ You must specify units for united attributes ▪ Tolerance1 and Tolerance2 - only applicable for numeric values; use with units if applicable, or use DB units in comparison 	Symbol	Equivalent Text	=	EQ	>	GT	>=	GE	<	LT	<=	LE	<> !=	NE	~	Like	!~	NOT Like
Symbol	Equivalent Text																		
=	EQ																		
>	GT																		
>=	GE																		
<	LT																		
<=	LE																		
<> !=	NE																		
~	Like																		
!~	NOT Like																		
Control	<ul style="list-style-type: none"> ▪ LimitToObjectTypes ▪ ExcludeObjectTypes ▪ ExcludeClashes ▪ RelationNavigationPath 																		

Rule Tag	Details
Examples	<ul style="list-style-type: none"> For clashes between imported slabs <pre><ByAttribute LimitToObjectTypes="Slab" Interfacel="IJUASlabGeneralType" Attribute1="Composition" Operator1="EQ" Value1="Imported_Slab" Interface2="IJUASlabGeneralType" Attribute2="Composition" Operator2="EQ" Value2="Imported_Slab"/></pre> For clashes between braces and slab, footings, and footing components <pre><ByAttribute LimitToObjectTypes1="Member Part *" LimitToObjectTypes2="Slab, Footing, Footing Component" Interfacel="ISPSMemberType" Attribute1="TypeCategory" Operator1="EQ" Value1="Brace" Interface2="*" Attribute2="*" Operator2="EQ" Value2="*"/></pre> For clashes between braces and beams, columns, and braces <pre><ByAttribute Interfacel="ISPSMemberType" Attribute1="TypeCategory" Operator1="EQ" Value1="Brace" Interface2="ISPSMemberType" Attribute2="TypeCategory" Operator2="EQ" Value2="Beam Column Brace"/></pre>
<i>ByR3DProject, ByR3DFile</i> Decision based on clash involving R3D objects based on the R3D project name or the R3D file name from which the object originated	
Attributes	<ul style="list-style-type: none"> Name1Equals/Name1Like - a matching value of an R3D project name or an R3D file name Name2Equals/Name2Like - a matching value of an R3D project name or an R3D file name
Control	<ul style="list-style-type: none"> LimitToObjectTypes ExcludeObjectTypes ExcludeClashes

Rule Tag	Details
Examples	<ul style="list-style-type: none"> For clashes between R3D objects from R3DBuildings and R3DFacilities projects: <pre><ByR3DProject Name1Equals="R3DBuildings" Name2Equals="R3DFacilities"/></pre> For clashes between R3D objects from R3D file named *doors.* and *doorframes.*: <pre><ByR3DFile Name1Like="*doors.*" Name2Like="*doorframes.*"/></pre>
ByCommonAttributeValues Decision based on a clash involving two objects that have common attribute values for one or more given properties	
Attributes	<ul style="list-style-type: none"> Interface1, Interface2, Interface3, and so forth - the names of the interfaces that correspond to Attribute1, Attribute2, Attribute3, and so forth Attribute1, Attribute2, Attribute3, and so forth - the attribute names in Smart 3D <p> NOTE You must use interfaces and attributes in pairs, for example, Interface1 and Attribute1, or Interface3 and Attribute3</p>
Control	<ul style="list-style-type: none"> LimitToObjectTypes ExcludeObjectTypes ExcludeClashes RelationNavigationPath
Example	<p>For clashes between individual members of stairs; for example, individual unconnected members with common attribute values identify a group of objects as a stair:</p> <pre><ByCommonAttributeValues ObjectTypesList="Member Part Linear, Member Part Curve" Interface1="IJUABuilding" Attribute1="BuildingID" Interface2="IJUASTairsByPieces" Attribute2="StairID"/></pre>
ByCommonAncestor Decision based on two objects with a common system ancestor	
Attribute	AncestorInterfaces - names of the interfaces to be evaluated by the object's ancestor in the system hierarchy

Rule Tag	Details
Control	<ul style="list-style-type: none"> ▪ LimitToObjectTypes ▪ ExcludeObjectTypes ▪ ExcludeClashes
Example	<p>Evaluates clashes between welds of the same pipeline:</p> <pre><ByCommonAncestor LimitToObjectTypes="Piping Welds" AncestorInterfaces="IJPipelineSystem"/></pre>
<p><i>Interconnected</i></p> <p>Eliminates clashes between route parts connected by one intermediate part but clashing in different aspects; typically used for pipes that are adjacent to an elbow, tee, or branch component that clashes on an insulation aspect</p>	
Attributes	<ul style="list-style-type: none"> ▪ ObjectTypes - the object types to consider ▪ ClashingAspect - the aspect to consider
Example	<p>Qualifies clashes between interconnected parts in the insulation aspect for both pipes and ducts:</p> <pre><Interconnected ObjectTypes="Pipes, Ducts" ClashingAspect="Insulation"/></pre>
<p><i>RangeBoxesDoNotOverlapAfterTrimming</i> and <i>OrientedRangeBoxesDoNotOverlapAfterTrimming</i></p> <p>Decision made by checking whether an object's range boxes still overlap after the range boxes shrink by a given tolerance</p> <p>NOTE This rule is useful when a horizontal pipe slightly overlaps a steel part, and for similar configurations in other global directions.</p>	
Attributes	<p>Trim1 and Trim2 - the tolerance to trim the range box (RangeBoxesDoNotOverlapAfterTrimming) or the oriented range box (OrientedRangeBoxesDoNotOverlapAfterTrimming)</p> <p>NOTE Apply trim values to achieve the same effect as specifying Negative Clearance. This is useful when a pipe rests on or slightly overlaps a steel member underneath the pipe.</p>
Control	<ul style="list-style-type: none"> ▪ LimitToObjectTypes ▪ ExcludeObjectTypes ▪ ExcludeClashes

Rule Tag	Details
Examples	<ul style="list-style-type: none"> ▪ RangeBox - eliminates touching or slightly overlapping clashes between two objects in simple physical aspect, and clashes that involve the insulation aspect of piping, duct, or equipment parts with other objects, such as steel: NOTE RangeBox implies the objects' extents along global X,Y,Z directions, and is bigger for objects in skewed directions (that is, objects that are not along a global X,Y,Z axis). Therefore, the first example is suited for situations where a horizontal pipe slightly overlaps a steel component, and similar configurations in other global directions. <pre><RangeBoxesDoNotOverlapAfterTrimming Trim1="2mm" Trim2="2mm" LimitToObjectTypes1="Pipes, Piping*" LimitToObjectTypes2="Member Part *"/></pre> ▪ OrientedRangeBox - a tight box in any orientation that resolves clashes in skewed directions: <pre><OrientedRangeBoxesDoNotOverlapAfterTrimming Trim1="2mm" Trim2="2mm" LimitToObjectTypes1="Pipes, Piping*" LimitToObjectTypes2="Member Part *"/></pre> <p>NOTES</p> <ul style="list-style-type: none"> ▪ Range does not typically include insulation. However, both RangeBox and OrientedRangeBox expand the simple physical range by insulation thickness all-around for piping, duct, and equipment parts. This expansion resolves small overlap clashes between piping, duct, and equipment insulation and other parts. ▪ For other cases, RangeBox and OrientedRangeBox do not resolve clashes that involve non-simple physical aspects.
<p>SlabPenetration</p> <p>Decision made by checking if the clash situation involves an object that penetrates a slab</p>	
Attributes	<ul style="list-style-type: none"> ▪ SlabTypes - a comma-separated list of slab catalog part numbers ▪ ObjectTypesList - a comma-separated list of object types that penetrate the slab ▪ PipeNPDLessThanOrEqualTo - the NPD for penetrating pipe situation ▪ MemberTypeCategoryList - a list of MemberType categories the software ignores when the software encounters a penetrating member part

Rule Tag	Details
Example	<p>Ignores a clash that involves a grating slab penetrated by either a pipe less than three inches in diameter, a handrail, or a member part (column or brace type):</p> <pre><SlabPenetration SlabTypes="Grating" ObjectTypesList="Pipes,Handrails,Member Part *" PipeNPDLessThanOrEqualTo="3in" MemberTypeCategoryList="Column,Brace"/></pre>
<p><i>WithinToleranceToMemberPartEnd</i></p> <p>Decision made by checking if the clash involves a member part within a certain tolerance from the end of the member part</p>	
Attributes	<ul style="list-style-type: none"> ▪ Tolerance - maximum distance (the tolerance) between the member end and the clash ▪ ObjectTypesList - limits the check to specific objects; '*' is permitted ▪ MemberTypeCategoryList - list of MemberType categories
Example	<p>Qualifies clashes that involve any objects with columns or braces within 10 inches from the part end:</p> <pre><WithinToleranceToMemberPartEnd Tolerance="10in" ObjectTypesList="*" MemberTypeCategoryList="Column,Brace"/></pre>
<p><i>ByIndividualObjectRules</i></p> <p>Decision based on a clash between two single object rules; you can combine different rule types under the ByIndividualObjectRules tag</p> <p>NOTES</p> <ul style="list-style-type: none"> ▪ You must use two rules that evaluate single objects under the ByIndividualObjectRules tag as shown below: <pre><ByIndividualObjectRules> <Rule#1 Criteria attributes for Rule#1/> <Rule#2 Criteria attributes for Rule#2/> </ByIndividualObjectRules></pre> ▪ For more information, see <i>Rules Evaluating a Single Object</i> (on page 57) ▪ The ByIndividualObjectRules rule is evaluated when: <ul style="list-style-type: none"> ▪ Rule#1 evaluates ObjectA and Rule#2 evaluates ObjectB, or ▪ Rule#1 evaluates ObjectB and Rule#2 evaluates Object A 	
Control	<ul style="list-style-type: none"> ▪ LimitToObjectTypes ▪ ExcludeObjectTypes ▪ ExcludeClashes

Rule Tag	Details
Example	<p>Qualifies clashes between welds and sleeves:</p> <pre> <ByIndividualObjectRules LimitToObjectTypes= "Piping Welds, Piping Specialty Items"> <ByObjectType List="Piping Welds"/> <ByInterfaces List="IJUASleeve" LimitToObjectTypes="Piping Specialty Items"/> </ByIndividualObjectRules> </pre>
<p><i>ByRulesCombination</i></p> <p>Decision based on combined rules that evaluate two clashing objects; the rule is evaluated if all of the combined rules are evaluated</p> <p>NOTES</p> <ul style="list-style-type: none"> ▪ The software automatically runs underlying sub rules, as shown in the following scenarios: <ul style="list-style-type: none"> ▪ In one sub rule, object A and object B of a clash may evaluate the rule's part 1 and part 2 criteria, respectively ▪ In another sub rule, object A and object B of a clash may evaluate the rule's part 2 and part 1 criteria, respectively ▪ The software cannot force a match between the two sub rules with specific object references as shown in the above example; instead, use the LimitToObjectTypes criteria on each sub rule to evaluate the rule 	
Control	<ul style="list-style-type: none"> ▪ LimitToObjectTypes ▪ ExcludeObjectTypes ▪ ExcludeClashes

Rule Tag	Details
Example	<p>Qualifies clashes between approved underground cable tray and approved underground equipment pits where both construction types are set to Existing to be reused in place:</p> <pre> <ByRulesCombination LimitToObjectTypes1="Cable Trays" LimitToObjectTypes2="Equipment"> <ByObjectPG List1="Underground Cabletray" List2="Underground Equipment"/> <ByAttribute Interfacel="IJConstructionInfo" Attribute1="ConstructionType" Operator1="EQ" Value1=":17" Interface2="IJConstructionInfo" Attribute2="ConstructionType" Operator2="EQ" Value2=":17"/> <ByAttribute Interfacel="IJObject" Attribute1="ApprovalStatus" Operator1="EQ" Value1=":8" Interface2="IJObject" Attribute2="ApprovalStatus" Operator2="EQ" Value2=":8"/> </ByRulesCombination> </pre>

Control Rule Evaluation

Use Screening Attributes to Limit Rule Application

You can limit rules to apply to a specific clash situation with screening attributes that provide additional criteria. If the rule does not meet the additional screening criteria, the software does not evaluate the rule. Limiting the rules that the software evaluates improves software performance.

Attributes for Rules that Evaluate One or Two Objects

LimitToObjectTypes

Evaluates the rule only if **ObjectTypeA** and **ObjectTypeB** exist in the lists. For more information on interference lists, see *List interferences* (on page 29).

ExcludeObjectTypes

Evaluates the rule only if **ObjectTypeA** and **ObjectTypeB** do not exist in the lists.

Attributes for Rules that Evaluate Two Objects

ExcludeClashes

- Prevents a rule from evaluating a clash between specified **ObjectTypes** (objects in **List1** that clash with objects in **List2**).

- Expects **Value** as **ObjectTypesList1** and **/ObjectTypesList2**, as shown in the following example:
ExcludeClashes="Ducts, Pip*, Equipment, Cable Tray/ Hanger, Member Part Prismatic"

LimitToObjectTypes1 and LimitToObjectTypes2

- Evaluates the rule only if:
 - **ObjectType1** exists in the **LimitToObjectTypes1** list or in the **LimitToObjectTypes2** list,
and
 - **ObjectType2** meets **ObjectType1** requirements,
or
 - **ObjectType1** meets **ObjectType2** requirements.
- Expects **Value** as a list of one or more **ObjectTypes**.

ExcludeObjectTypes1 and ExcludeObjectTypes2

- Evaluates the rule only if:
 - **ObjectType1** does not exist in the **ExcludeObjectTypes1** list and **ObjectType2** does not exist in the **ExcludeObjectTypes2** list,
or
 - **ObjectType1** does not exist in the **ExcludeObjectTypes2** list and **ObjectType2** does not exist in the **ExcludeObjectTypes1** list.
- Expects **Value** as a list of one or more **ObjectTypes**.

LimitToObjectTypes1 and ExcludeObjectTypes2

- Evaluates the rule only if:
 - **ObjectType1** exists in the **LimitToObjectTypes1** list and **ObjectType2** does not exist in the **ExcludeObjectTypes2** list,
or
 - **ObjectType2** exists in the **LimitToObjectTypes1** list and **ObjectType1** does not exist in the **ExcludeObjectTypes2** list.
- Expects **Value** as a list of one or more **ObjectTypes**.

Example 1

The following rule uses the interfaces approach to ignore clashes between pipe welds and piping parts:

```
<ByInterfaces List1="IJRtePipeWeld" List2="IJRtePipePart"  
  LimitToObjectTypes1="Piping Welds"  
  LimitToObjectTypes2="Pipes, Piping *"/>
```

Example 2

The following rule ignores clashes between non-equipment and non-equipment foundation objects named 'X' and non-slab and non-plate objects named 'Y':

```
<ByName
  Name1="X" ExcludeObjectTypes1="Equipment, Equipment Foundation"
  Name2="Y" ExcludeObjectTypes2="Slab, Plate"/>
```

Clash Situation	Rule Ignores Clash
Equipment X and Slab Y	No
Equipment X and Pipe Y	No
Conduit X and CableTray Y	Yes
Conduit X and Pipe Y	Yes
Slab X and Equipment Y	Yes
Slab X and Pipe Y	Yes
Pipe X and Slab Y	No

Example 3

The following rule ignores clashes between objects named 'X' and 'Y'; the software does not apply the rule to an equipment and equipment foundation clash with a slab and plate:

```
<ByName
  Name1="X" Name2="Y"
  ExcludeClashes="Equipment, Equipment Foundation / Slab, Plate"/>
```

Clash Situation	Rule Evaluated	Rule Ignores Clash
Equipment X and Slab Y	Yes	
Equipment X and Slab X	Yes	
Equipment X and Pipe Y	No	Yes
Equipment Y and Pipe X	No	Yes
Conduit X and CableTray Y	No	Yes
Conduit X and Pipe Y	No	Yes
Slab X and Equipment Y	Yes	
Slab X and Pipe Y	No	Yes
Slab A and Pipe Z	No	No

Clash Situation	Rule Evaluated	Rule Ignores Clash
Equipment X and Plate Y	Yes	
Equipment Y and Plate X	Yes	
Equipment A and Plate Z	Yes	

Evaluate Rule Criteria Using Related Object Data

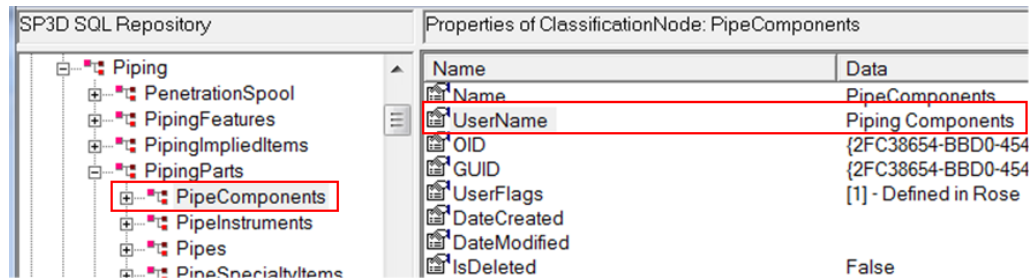
Many single object rules and two object rules have an advanced option to evaluate rule criteria of an object that is related to the object that the rule is evaluating. You specify the **RelationNavigationPath** or the **RelationNavigationPath1/2** value to specify the location of the related object in relation to the object under evaluation.

NOTE The expression format described in the table below is similar to the **SelectSetBrowser** function in the Smart 3D Automation Toolkit. To test the expression in the **Select Set Browser**, replace the percentage sign (%) with a greater-than symbol (>).

RelationNavigationPath Expression	Definition
InterfaceName%RoleName[n]	<p>Navigates the relationship defined by InterfaceName and RoleName, and selects the n^{th} related object</p> <p>Example</p> <p>The following example evaluates pipe parts to run:</p> <pre>IJRtePathGenPart%Owner[1]</pre>
Interface%Role(FilterInterface)[n]	<p>Navigates the relationship defined by Interface and Role, filters objects that implement FilterInterface, and then selects the n^{th} object</p>
Interface1%Role1(Interface2)[m] Interface3%Role3[n] Interface4%Role4[p]	<p>Navigates objects related to Interface1%Role1 and selects the m^{th} object that implements Interface2</p> <p>From the object in the previous step, navigates Interface3>Role3 and selects the n^{th} object</p> <p>From the object in the second step, navigates Interface4>Role4 and selects the p^{th} object</p> <p>Example</p> <p>The following example evaluates pipe parts to pipeline:</p> <pre>IJRtePathGenPart%Owner[1]:IJSysstemChild%SystemParent[1]</pre>

Optimize and Fine Tune Rules

You can specify **ObjectTypes** as part of the rule criteria in several of the rule types. See the **Classification TopNodes** node in **MetaDataBrowser** to find the string to use with the **ObjectTypes** attribute, as highlighted in the illustration below.



NOTES

- You must provide the value from the **UserName** field.
- Only use exact **ObjectTypes** such as piping components. The software does not honor higher level BOC nodes such as Piping.

You can use the asterisk [*] as a wild card character. For example, type `Piping*` to include Piping Components, Piping Specialty Items, Piping Instruments, Piping Welds, and so forth in the rule.

When the software processes an object, the **ObjectType** is written to the **CodelessIFCRule** log file. You can refer to this log file to determine which **ObjectType** to use. Two example log entries are shown below:

Example 1

```
@2/3/2015 4:54:13 PM - ProcessObject ? [Piping Components] -
'Flange-0403'
```

Example 2

```
@10/28/2014 12:44:10 AM - CreateInterference ? - [Slab] - 'Slab-
0101' & [Member Part Linear] - 'MemberPart-0202'
```

You can simplify post-processing rules that support **LimitToObjectTypes1** and **LimitToObjectTypes2** if **LimitToObjectTypes1** and **LimitToObjectTypes2** have identical values. The simplified rule is **LimitToObjectTypes**. You can also simplify post-processing rules that support both **ExcludeObjectTypes1** and **ExcludeObjectTypes2** using **ExcludeObjectTypes**.

Several of the rules support wild cards for other rule criteria attributes. For more information on using wild cards, see *Advanced String Comparisons Using the Like Operator* in the tutorial available at <http://www.vb6.us/tutorials/conditional-expressions-visual-basic-tutorial>.

Glossary

approval state

Recorded state of acceptance of information contained in objects within the database. The approval states indicate a level of confidence in the information stored in the database and govern your ability to alter specific data about a product.

axis

An imaginary line used to define the orientation of a system or object normally defined in terms of an x-, y-, and z-axis. Some 3-D graphic objects have an associated axis used to define the center or axis for rotations.

basic design

Engineering definition of the model and its systems.

bill of material (BOM)

Hierarchical decomposition of a product into constituent assemblies and parts. Specific types of BOMs exist (for example, an EBOM is a bill of material from the point of view of an engineering department; an MBOM is a bill of material from the point of view of manufacturing).

bulkload

The process by which reference data in Microsoft Excel workbooks is loaded into the Catalog database.

catalog

Repository of information about components and materials used in construction. When you use catalog parts in the model, the software places an occurrence of the catalog part in the project. This occurrence is a copy of the actual catalog part.

Catalog database

The database that contains the reference data. Each model database can reference a different Catalog database.

change history

Process of recording information such as who, when, and why for any given modification.

change management

Software features or manual procedures for managing the consequence of change. For example, software can support a change management feature to report drawings that need updating as a result of a change in a 3-D model.

change propagation

Ability of the software to intelligently modify dependent design information to reflect change in a higher order object.

class

Grouping of individual objects that share some very significant, common characteristics.

classification folder

A folder in the Catalog hierarchy that contains part classes. Classification folders are one level above part classes. The ClassNodeType and R-ClassNodeDescribes sheets in the Microsoft Excel workbooks define the classification folders.

codelist

A set of acceptable values for a particular property that can be referred to by an index number or selected in a combo box. For example, the codelist for the material specification allows you to select from a set of standard entries, such as ASTM A183-F316 Stainless Steel.

commodity code

A user-defined code that provides an index to parts in a catalog.

commodity item

A standard component found in a manufacturer catalog (an off-the-shelf component).

component

Physical part that a feature generates.

concurrent access

Ability of the software to allow multiple users to simultaneously access and modify the design of a model.

consolidated tasks

A collection of tasks run in batch. For example, the software allows you to extract a set of drawings immediately or to schedule the batch extraction for a future time.

constraints

A logical restriction that controls how part symbols ports relate to each other and to reference ports. There are four constraints: parallel, perpendicular, coincident, and distance.

contract

A Work Breakdown Structure object representing a scope of work, usually performed by an external supplier. The contract is related to a project and appears in the Work Breakdown Structure hierarchy.

coordinate

The location of a point along the X-, Y-, or Z-axis.

coordinate system

A geometric relation used to denote the location of points in the model. The most common coordinate system is the rectangular coordinate system, whereby points are located by traversing the X-, Y-, and Z-axes of the model. Normally, coordinate systems have their origin defined as 0,0,0.

cutting plane

A plane that cuts through an object.

damage records

Data relating to the damage and repair of structure or components that occurred during or after construction of a plant.

data interchange

Capability to output the design, or portions of the design, in a standard format for use or movement to another computer software system.

database

Repository for the product model data. The database contains information to describe individual objects in the data model and the relationships between objects as appropriate.

database backup

Process of recording a backup copy of the complete database or the incremental changes after the date that the last complete copy was created.

database break and recovery

Utilities used to restore a database after files are corrupted.

database copy

Functionality to copy large collections of model objects from one design project to another design project.

database management

Functionality related to managing a product model database.

database monitor record

Transactions that occur in order to provide database (DB) recovery after a stop in response with a minimum of lost data.

degree

The highest polynomial factor in the curve or surface mathematical definition. A line is a degree 1 curve, while a cubic B-spline is a degree 3 curve.

design alternative

Difference in a design represented by a separate version. A design alternative can be a new design prepared as a proposed change, or one of several elective options that the builder or customer selects. Each design alternative has an identification assigned so you can uniquely refer to the design alternatives.

design approval log

Record of review and approval of parts of the design.

design data auto input

Automation in loading existing design data into a new design database.

design documents

Drawings, sketches, material lists, procedures, and so forth that are generated during the design phase.

design object

Any object with properties that you can select. A design object can be related to one or more contracts of different types, but related only to one contract of a given type.

design progress check

Analysis of the content of the design to some metric unit that gives an idea of the degree of completion.

design review

Functionality to support rapid viewing of the design and markup of features with comments.

design service

Any general system services related to the design function.

design standard

Feature or object used in plant design that has been determined to the normal or approved way of accomplishing a design requirement. In the context of computer software, the term refers to computer functionality to support standards, not the standard itself.

detail schedule

Lowest level of schedule used to manage and track work progress.

distributed systems

Systems consisting of sequential parts with a distributive characteristic (for example, pipes distribute fluids, HVAC distributes air, cabling distributes power, and structure distributes loads).

distribution systems

Term synonymous and used interchangeably with the term distributed systems.

documentation

Drawings and other records that you must produce to document, obtain approval, or build the design.

drawing tool

Tool that helps in the process of creating, modifying, or manipulating objects. Examples are PinPoint and SmartSketch.

easting

A term that describes an east coordinate location in a coordinate system.

edge

A topological object that represents a trimmed curve bounded by a start and end vertex.

edge distance

The distance from the center of a bolt or rivet to the edge of a plate or flange.

equipment catalog

Catalog of equipment geometry and limited properties that the software uses to identify and visualize equipment and its placement in the model. The catalog is not the source for the total specification and ordering data for the object.

fabricate

To cut, punch, and sub-assemble members in the shop.

face-to-face

The overall length of a component from the inlet face to the outlet face.

fasteners

Bolts and rivets used to connect structural members.

element

Primitive geometric shape such as a line, circle, or arc.

fence

Boundary or barrier that separates or closes off an area. To surround or close like a fence.

field adjustment

Material added to the neat design geometry of piping or structural parts to allow for fit up in the case that extra material is required due to uncontrolled variance in the manufacturing and construction process.

flavor

A different variation of a symbol. Each variation has different occurrence property values.

focus of rotation

A point or line about which an object or view turns.

full penetration weld

A type of weld in which the weld material extends through the complete thickness of the components being joined.

function points

Part of the requirements documentation, function points are the smallest granularity of a requirement statement that describe specific detailed actions that the software performs.

functional block diagram

Schematic representation of a system (piping, electrical, ventilation) showing system parts and their relationship. You use symbols to represent equipment and components. A connecting network of lines illustrates their relationship. Taken together, the symbols and the network illustrate the function of the system.

furnishings

Parts such as movable articles and fittings that normally are not associated with a system (for example, a chair).

generic specific

Object that is parametrically defined or defined to suit a family of specific parts (for example, International Standards parametrics). For example, a 100 - 200 gpm pump in the catalog can provide a general shape to appear in the model until a specific object has been identified. See also specific and specific object.

GUIDs

Acronym that stands for Globally Unique Identifiers. The software automatically creates the GUIDs sheet in the Excel workbooks when you create the Catalog database and schema. The purpose of storing GUIDs within Excel workbooks is to help you keep track of what has been loaded into the database. Storing GUIDs also helps to avoid the situation in which a replacement Catalog database causes existing models to become invalid.

host location

The first location created for a Site. This host location is defined when the Database Wizard creates the Site database.

host server

The database server on which the Site database was created using the Database Wizard. Alternatively, if it is a restored database set, the Host Server is the database server where the Site database is restored. The Host Server in a Workshare environment contains the origin for the Site, Site Schema, Catalog, and Catalog Schema databases. Consequently, most Project Management and reference data work must take place at the Host.

initial design

Early stage of design work, generally before contract, used to estimate construction costs and provide a rough concept of the intended plant. Contains information relating to a plant created during its initial (concept) design period.

initial structural plan

Principal structural plan for the plant; also called a construction profile.

instantiation

Occurrence of a catalog object at a specific geometric location in the model.

interference checking

A process that identifies possible collisions or insufficient clearance between objects in the model.

job order

Industrial authorization for accomplishing work; synonymous with a work order.

kinematics analysis

Analysis of mechanical motion.

ksi

Kips per square inch.

leg length analysis

Preferred term is welding length analysis.

library

Resource of reference information that you can access in developing a plant design.

life cycle database

Information developed to assist in the maintenance and modernization of delivered plants.

link

Way to store information about another file in your document. You can update a link so that changes in the file appear in your document.

lintel

A horizontal member used to carry a wall over an opening.

load group

A grouping in which all components feature uniform load limits and stress safety characteristics. For example, if a pipe clamp from load group 5 has a maximum nominal load of 20kN, then so does a threaded rod from load group 5.

location

A Location is defined by three user-defined inputs: 1) a unique name, 2) a unique name rule ID, and 3) the server where the Site databases reside for that Location. A Location is defined and created when the Site database is created using the Database Wizard. Additional Locations can be created in the Project Management task. Each Location is a Site-level object, thus other Plants within the same Site collection can use the Locations when the Plants are configured for Workshare.

logical member

An object in the model used to represent the design topology.

machinery

Major pieces of equipment installed in a plant.

macro

A sequence of actions or commands that can be named and stored. When you run the macro, the software performs the actions or runs the commands. You can create the macros in Visual

Basic or other OLE-aware programming applications. Some of the other OLE-aware programming applications are Visual Basic for Applications, Visual C++, and so forth.

maintenance envelope

A rectangular box around the part for clearance during maintenance operations.

maintenance records

Records of breakdown, repair, and overhaul of equipment.

material analysis

Analysis of a completed design work for extracting detailed material requirements; also called material lists.

material list

An option category that controls the format and content of the bill of materials.

methods

Objects in the database that describe the manufacturing methods to the component parts of a plant.

move from point

Starting point for an action. For example, when you move an equipment object, the Move From point determines the point of origin for the move.

move to point

Ending point for an action. For example, when you move an equipment object, the Move To point determines where you want the move to stop.

MTO neutral file

A non-graphic output file that can be fed into a material control system. MTO stands for Material Take-Off.

node

- One of the set of discrete points in a flow graph.
- A terminal of any branch of a network or a terminal common to two or more branches of a network.
- An end point of any branch or a network or graph, or a junction common to two or more branches.

northing

A term that describes a north coordinate location in a coordinate system.

nozzle

A piping connection point to a piece of equipment.

nozzle standout

The shortest allowable distance between the connection point of a nozzle and the start point of a turn on the leg connected to the nozzle.

NPD (Nominal Piping Diameter)

The diameter of a pipe.

object

A type of data other than the native graphic format of the application.

occurrence (of part or equipment)

Instantiation of a part of equipment in the model that refers to the part library; an instance of a specific object. The design can be built several times, and therefore the occurrence can apply to more than one hull. Typically, an occurrence points back to a specific object, either for its complete definition, as in the case of a particular valve, or for its made from material, as in the case of a steel plate part cut from sheets. Thus, when a designer selects a component from the catalog and places it at a location in the space of the plant, the software creates an occurrence of that object in the plant design.

occurrence property

A characteristic that applies to an individual object in the model. Occurrence properties are designated with 'oa:' in the reference data workbooks. You can view and modify occurrence properties on the Occurrence tab of the properties dialog boxes in the software. Depending on the object, some occurrence properties are read-only.

origin

In coordinate geometry, the point where the X-, Y-, and Z-axes intersect.

origin point

The point at which the coordinate system is placed, providing a full Cartesian coordinate system with positive and negative quadrants. Points are placed at coordinates relative to the origin point, represented by the X, Y, and Z values.

orthogonal

The characteristic of an element consisting completely of elements positioned at 90-degree angles. A square is an orthogonal element.

orthographic

A depiction of an object created by projecting its features onto a plane along lines perpendicular to the plane.

P&ID

Diagram that shows the topology, functional components, and special requirements of a piping system; generally represents the engineering design of the system.

package

Set of closely related classes. (UML)

painting

Computation of paint surface and recording of paint system requirements.

parameter

A property whose value determines the characteristics or behavior of something.

part class

A group of similar objects. You can define part classes in the Excel workbooks. A part class can have multiple parts. For example, a heat exchanger part class can contain heat exchangers with different dimensions.

part number

Unique identifier of a part.

PDS (Plant Design System)

A comprehensive, intelligent, computer-aided design and engineering application for the process, power, and marine industries. PDS consists of integrated 2-D and 3-D modules that correspond to engineering tasks in the design workflow.

PinPoint

Tool that allows you to place, move, and modify elements with precision, relative to a reference point.

principle of superposition

The principle that states that the stresses, strains, and displacements due to different forces can be combined. This principle is only valid for linear analysis.

Product Data Management (PDM) System

Software intended to manage both product data and documents associated to the product data. Functionality typically includes: object-based data modeling tools, user administration, business rules, and document management. Document management typically includes document editing or reviewing, document mark-up or redline, document storage, and full-text retrieval.

product structure

Hierarchical breakdown or decomposition of a product into constituent parts, volumes, or units. (For example, a bill of material is one possible type of product structure.)

production planning

Functionality associated with the work breakdown and sequence of the construction of a plant.

promotion

Process of associating approval state with a product version. A product version begins its existence at a working approval state. When the version is at some level of maturity, its approval state is elevated to a higher approval state (that is, promoted). Then, further changes must be carefully controlled and generally require the data set demoted to a working state. One or more promotions can occur successively higher approval states (between working and approved) to represent various intermediate levels of review or progressive approval.

query select sets

Set of objects that are selected in a query or queries on the database.

reference data

The data that is necessary to design plants or ships using the software. Reference data includes graphical information, such as symbols. It also contains tabular information, such as physical dimensions and piping specifications.

resource estimation

Rough estimate of material, manpower, and facility utilization for the design and construction of the plant.

route

1) A line connecting a series of points in space and constituting a proposed or traveled route. 2) The set of links and junctions joined in series to establish a connection.

satellite server

The database server where the replicated databases reside for Workshare. The Satellite Server is not used unless Workshare is activated.

schema

A database that creates the structure of another database. For example, a schema specifies the queries, tables, fields, and data types in a database.

schema update utility

Functionality used to assist in processing existing product models to an updated database structure after you modify or add to the database structure.

site

The top level in the Project Management hierarchy. A Site configuration may contain several Catalogs, each shared by multiple Plants.

site administrator

Person responsible for managing the standards and general parameters for a given plant site within a Site database.

site setup

Functionality associated with establishing a new plant site or hull for design development.

sketch and trace

User interface for rough definition of a required design feature that typically works in a 2-D mode.

specifications

Contracted requirements for the plant.

stud

A bolt, threaded on both ends, used to connect components.

suspended floor

A concrete floor system built above and off the ground.

symmetric node

Type of vertex on a curve. A curve with a symmetric node has the same curvature on each side of the node. A handle can be attached to a symmetric node for editing.

system

A conceptual design grouping that organizes parts in hierarchical relationships. A system represents a functional view of the model and includes information such as system name, type, properties, and design specifications for the objects assigned to the system.

tag number

User-specific, unique number assigned to an object (for example, CV-101 for a control valve, HE-2002 for a heat exchanger).

target point

The origin for coordinate measurements displayed by PinPoint. You can position the target point anywhere on the drawing sheet or view.

tolerant geometry

A type of ACIS geometry - either an edge or a vertex - that is outside the tolerance for ACIS and requires special handling.

trimmed surface

A surface whose boundary is fully or partially inside the "natural" geometric definition of the surface. Some or the entire control polygon extends outside the face boundary.

trunk

Feature that quickly reserves space for the distributive systems and other systems that have a path. Along the trunk are stations that define the cross section and identify part or system membership.

unit/module modeler

Facility of the system to structure collections of equipment and components into a single identifiable object.

user attributes

A customized property in the reference data. The Custom Interfaces sheets in the Excel workbooks define these properties. You can list the customized properties on the individual part class sheets.

version control

Ability of the system to manage multiple versions of a single part of the design. Version control should support conditional analysis and promotion status, as well as alternate design features among hulls within a plant site.

vertex

A topological object that represents a point in the three-dimensional model.

viewset

Set of objects (usually a subset of the entire database) that a view operation uses. Membership or lack of membership for any object in a viewset does not affect the actual stored representation of the object, but only its availability or desirability for viewing in the current scenario.

weight and CG analysis

Routines that compute the weight of commodity materials as configured in a given design (for example, plate and pipe) and determine total weight and center of gravity (CG) for a collection of material and equipment, as well as the complete plant.

welding

Weld requirements for joining materials. Welding length analysis is the calculation of required weld dimensions; also called leg length analysis.

wirebody

A topological object that represents a collection of edges jointed at their common endpoints.

wizard

Software routine attached to an application that provides guidance and expert help to you to complete one of the functionalities of the application.

work content

Estimation development of metrics from the database that relates to the work hour content of the various construction units.

work order

Plant authorization for completing work; synonymous with a job order.

working plane

The available 2-D plane of movement for endpoint selection.

workset

Set of objects (usually a subset of the entire database) used in an interactive change, add, or delete operation. Membership or lack of membership for any object in a workset does not necessarily affect the actual stored representation of an object. However, you can change or delete an object in a workset that also results in a change or deletion of the stored object. Similarly, when you add a new object (not currently stored) to a workset, the software also adds the object container.

workspace

Area that represents the portion of the model data needed to perform the intended task and includes the user modeling settings.

workspace document

Document into which you can extract a portion of the model data for a user task.

Workspace Explorer

Tree or list representation of objects in your workspace.

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